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Evaluation of the Cost-Effectiveness of Nonstructural Pollution Controls: A Manual for Water Quality Management Planning

CONSAD Research Corp, Pittsburgh, Pa

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EVALUATION OF THE COST-EFFECTIVENESS OF NONSTRUCTURAL POLLUTION CONTROLS: A MANUAL FOR WATER QUALITY MANAGEMENT PLANNING

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this manual is to develop and illustrate a procedure for the estimation of the cost of nonstructural pollution controls for use in evaluating the cost-effectiveness of implementing such controls.

Section 208 of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) encourages the states to designate areawide planning agencies to develop waste treatment management plans. The states are responsible for developing such plans where areawide agencies have not been designated.*

The water quality management plans are to specify abatement measures for sources of water pollution. These abatement measures may be implemented through construction of pollution control devices, as well as through regulation of pollution generating activities pursuant to Section 208(b)(2)(c).** Therefore, abatement measures can for convenience be grouped into two broad categories: structural pollution controls and nonstructural pollution controls.

Title II of the Federal Water Pollution Control Act Amendments of 1972 requires the development of a cost-effective analysis of any structural pollution control receiving Federal financial assistance under the Act. To provide consistency in the evaluation of structural and nonstructural pollution controls, and to permit the systematic comparison of the application of these pollution controls in any particular situation, cost-effectiveness analysis of any nonstructural pollution control is highly desirable.

The evaluation of nonstructural alternatives in pollution control, although not widely practiced or well-documented, potentially offers considerable advantages in identifying cost-effective solutions. Used instead of or as a complement to structural approaches, nonstructural alternatives can increase the effectiveness and/or decrease the costs of achieving certain objectives. For example, a relatively unsophisticated evaluation methodology has been applied to alternative structural and nonstructural flood control and water recreation policies for the Tocks Island Lake Project.* This analysis has led to the conclusion that the flood damage control purpose could be fulfilled at a lower cost to society by adopting a policy including both structural and nonstructural controls rather than employing only standard structural measures. Unfortunately, no other strong examples of a careful evaluation of this type were identified in the course of preparing this manual.

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*See 40 CFR Part 130, 131, Federal Register, Vol. 40, No. 230, Friday, November 28, 1975.

**See Guidelines for Areawide Waste Treatment Management Planning, August, 1975, pp. 7-2, 7-3.

1.2 Basic Concepts

The term "structural pollution control" has been used to describe distinct physical facilities built and operated to reduce or restrict discharge of pollutants, and specifically of polluted water. Such controls normally necessitate expenditure for construction, installation, operation and maintenance of these facilities.

Conversely, the term "nonstructural pollution control" has often been used to describe changes in the use of land or in the manner in which activities are performed on the land. The term has been used to indicate both technical measures and requirements, such as vegatative stabilization and runoff diversion, and the regulatory approaches to induce utilization of such measures and requirements. The cost-effectiveness analysis described in this manual is primarily applicable to the regulatory approaches. Compliance with a nonstructural control may not involve readily identifiable direct expenditures for modification of the physical configuration of either the controlled properties or the physical facilities constructed on these properties. Yet, in many instances, properties can also be brought into compliance with a nonstructural pollution control, i.e., a regulatory measure, through the installation of structural pollution control devices. For example, if a performance criterion is developed for runoff, specifying that only a certain percentage increase above the natural rate of runoff is allowed, this criterion can be satisfied either by initiating nonstructural modifications of activities or by installing structural controls or by some combination of structural and nonstructural measures. The assumption of this handbook is that a regulatory measure can specify required performance, e.g., amount of runoff, and the persons subject to the requirement can determine for themselves the most cost-effective technique, structural or nonstructural, for satisfying the requirement.

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*URS/Madigan-Praeger, Inc., and Conklin and Rossant, "A Comprehensive Study of the Tocks Island Lake Project and Alternatives," June, 1975.

Although the cost incurred by a user of land as a result of a structural pollution control may be accurately measured by the expenditure which the individual must undertake to comply with the stipulations of the control, direct expenditures might not be incurred by a user of land in complying with a nonstructural pollution control. In applying cost-effectiveness analysis to the evaluation of nonstructural pollution controls, therefore, an indirect procedure must be employed to measure the cost of a control. This indirect procedure involves examination of several elements, including changes in the market values of any properties affected by the control, the private cost of complying with the administrative requirements established to implement the control, and the cost incurred by public agencies in monitoring the control.

1.3 Methods of Implementation

The following forms of regulation, tax policy, and review requirements might be designed to operate as, or encourage use of, nonstructural pollution controls.

- Land use controls:
  - Municipal zoning,
  - Planned unit development,
  - Cluster development,
  - Bonus or intensity zoning,
  - Flood plain zoning,
  - Development rights transfer;

- Performance criteria related to land management:
  - Subdivision regulation,
  - Building codes,
  - Flood plain and coastal use standards,
  - Runoff control standards;

- Growth management controls:
  - Sewer moratoria,
  - Subdivision moratoria,
  - Time-phased issuance of building permits,
  - Adequate public facilities ordinances,
  - Interim zoning control,
  - Holding zones;

° Public acquisition of land or interests in land:
  °° Eminent domain condemnation,
  °° Conservation easements,
  °° Flooding easements,
  °° Dedication of land;

° Pricing and taxation systems:
  °° Preferential property tax assessment,
  °° Development fees and charges;

° Planning and review processes:
  °° Comprehensive plans,
  °° Mandatory referral provisions,
  °° Environmental impact statements,
  °° A-95 review.

These controls are normally employed for a variety of reasons, only one of which may be the attainment of water quality objectives. For example, they might be employed to improve air quality, reduce noise pollution, increase the aesthetic quality of property, decrease ecological disruption, restrain the consumption of energy and water, or increase the social return from public facilities. Yet, because the controls also exhibit substantial potential as techniques for the improvement of water quality, it is important to incorporate water quality considerations into decisions determining their use.

Any one, or a number, of these different methods might be employed to induce or encourage use of various technical measures* designed to cope with different sources of pollution. For example, a variety of technical measures such as vegetative stabilization, have been devised to prevent erosion during construction. A municipality might require through a permit system that developers adopt such a specific practice. On the other hand, the municipality might simply establish runoff control standards, and grant the developer a wider measure of discretion in choosing which practice to utilize.

1.4 Evaluating Nonstructural Approaches to Pollution Control

The methodology developed in this manual demonstrates that the decision to implement any nonstructural pollution control requires resolution of the following issues:

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*Descriptions of technical measures can be found in EPA's series of documents on control of pollution from nonpoint sources.

Legal Feasibility

- Is the adoption of the nonstructural pollution control legally feasible? [Chapter 2.0]
  - Does the proposed implementing agency possess the legal authority to impose the control? [Sections 2.1, 2.4, and 2.5]
  - Is the implementation of the control reasonably related to the accomplishment of some valid public purpose? [Sections 2.2, 2.4, and 2.5]
  - Is the application of the control in this situation consistent with the actions which have been taken with respect to the application of this control in other similar situations? Will the control treat the properties to which it is applied similarly to the manner in which similarly situated properties have been treated in previous decisions concerning the application of the control? [Sections 2.3 and 2.5.3]
  - Is the imposition of the control likely to cause the unconstitutional "taking" of some property which will require either the payment of "just compensation" to the owners of the property or the invalidation of the control? [Sections 2.4, 2.5.2, and 2.5.3]

Cost-Effectiveness

- Is the adoption of this nonstructural pollution control likely to be cost-effective in the aggregate? [Section 3.2]
  - By how much will the market value of the properties to which this control is applied change as a result of the control? [Sections 3.1 and 3.5] (If the method which is employed to evaluate this change in market value is only capable of estimating the amount by which value will change as a result of the modification of activities performed on the controlled properties which is induced by the control, it will be necessary to estimate separately the cost incurred by the owners of the con-

trolled properties in complying with the administrative review procedures associated with the control. [Sections 3.1 and 3.4])

  - °° How much cost will be incurred by the public sector in this situation in applying the administrative process which has been established for the implementation of the control? [Sections 3.2 and 3.4]

Social Impacts

- ° What will be the impact of the nonstructural pollution control on the distribution of welfare among the various members of society? [Chapter 4.0]

  - °° What significant or measurable effect will the control have on the employment and income of the residents of the planning district? [Section 4.1]

  - °° What influence will the control have on the distributions of employment and income among different population groups within the planning district and throughout society? [Section 4.1]

  - °° What effect can the control be expected to have upon the tax bases of the various political jurisdictions within the planning district? [Section 4.2]

  - °° What impact is the control likely to exert on the market value of different properties within the planning district and, hence, upon the distribution of wealth among the various owners of property within the district? [Section 4.3]

- ° Considering these assessments of the legal feasibility, cost-effectiveness, and distributional implications of this nonstructural pollution control, can this control be expected to be better than any alternative structural or nonstructural pollution control in this situation? [Chapter 4.0]

- ° In what manner and to what extent can the introduction of any compensatory mechanism be expected to temper the distributional impacts of the imposition of nonstructural pollution controls? [Chapter 5.0]

- Is the introduction of the compensatory mechanism legally feasible? [Chapters 2.0 and 5.0]
    - Does the planning agency possess the legal authority to introduce the mechanism? [Chapter 5.0 and Sections 2.1 and 2.5.1]
    - Is the introduction of the mechanism reasonably related to the accomplishment of some valid public purpose? [Chapter 5.0 and Sections 2.2 and 2.5.1]
    - Can the mechanism be expected to treat all similarly situated properties similarly? [Chapter 5.0 and Section 2.3]
    - Is the mechanism likely to cause the unconstitutional "taking" of some property without the payment of "just compensation" to the owners of this property? [Chapter 5.0 and Section 2.4]
- Will the implementation of the compensatory mechanism be administratively workable? [Chapter 5.0]
- Is the adoption of the compensatory mechanism politically acceptable to the constituency of the political jurisdiction? [Chapter 5.0]

To assist in exploration of these questions, this manual contains:

- Guidelines for the determination of the legal feasibility of implementing any nonstructural pollution control,
- A theoretically valid procedure for the evaluation of the aggregate cost-effectiveness of implementing any nonstructural pollution control,
- Procedures for the evaluation of the expected impacts of any nonstructural pollution control on employment, income, wealth, and tax bases both within the local planning district and throughout the society,
- Guidelines for the evaluation of the social desirability and legal feasibility of adopting various mechanisms to compensate landowners for the adverse distributional effects resulting from nonstructural pollution controls.

2.0 THE LEGAL FEASIBILITY OF NON-STRUCTURAL POLLUTION CONTROLS

It is difficult to generalize about the regulatory powers of state and local governments with respect to land use, due to the nature of our Federal system which allocates governmental powers between the national and state governments. Within broad limits set forth in the United States Constitution, each state may impose different limits on its power over privately-owned land within its borders. Because of different limitations on state power in their respective constitutions, different patterns of historical development, and differences in the attitudes of the members of their respective courts, the legal acceptability of particular types of governmental controls can vary widely among the states. Land use controls are primarily directed toward the use and development of land within each state, rather than with the interstate aspects of land use. Therefore, the legal validity of any control technique is usually a matter of local rather than Federal law.

It is possible to identify certain basic limitations on land use controls and trends in land use control strategies which have received judicial approval in a number of states. It is also possible to conclude that a court will be more willing to uphold particular controls where the public interest and the public need to be served by those controls in the particular situation is made apparent to the court. The various controls and strategies discussed in this manual are thought to be generally acceptable ones. However, it is essential that the planner consult legal authorities on the local law of their jurisdiction before making any final selection of one or more nonstructural pollution controls for implementation in a particular state.

Courts have recognized certain limitations upon the ability of a governmental unit to interfere with a landowner's right to make particular uses of his property. These limits are crystalized in the fifth and fourteenth amendments to the Federal Constitution which provide:

- That no person shall be deprived of property without due process of law,
- Nor shall private property be taken for public use without just compensation, and

- That no state shall deny any person within its jurisdiction the equal protection of the law.

While the Federal Constitution serves as the ultimate limitation upon Federal and state governmental powers, all fifty states have developed similar restrictions upon governmental powers under the headings of "due process," "equal protection," "public purpose," and "just compensation." Different states may use somewhat different tests for determining when a particular measure transgresses these limits. However, all impose essentially the same requirements on governmental activities affecting private rights in land:

- The governmental agency must possess the authority to impose the particular regulation or take the particular action in question.[1]
- The particular regulation must be reasonably related to some proper public, as opposed to private, purpose.[2]
- The particular action must not unduly discriminate against one individual, whether for the benefit of the public at large or of other particular individuals: that is, similar situations and problems must be treated similarly.[3]

Where these three conditions are met, the courts generally will uphold the particular governmental action in question.

2.1 Adequate Enabling Legislation

While all three of the above requirements are of equal importance to the validity of any particular governmental action, probably the most readily apparent requirement is that of the authority of the governmental agency to undertake the particular action. Thus, whatever strategy or mix of strategies may be selected for nonstructural control of water pollution, the planner must first ask: Does the governmental agency which is to be charged with carrying out regulatory measures have the authority to impose the particular strategy desired, either under appropriate enabling legislation from the state legislature or a constitutional or legislative grant of home rule? For example, does the municipality have the authority to impose zoning or subdivision regulations, to acquire property rights by the exercise of the power of eminent domain (the power to compel a sale of property rights by the private owner to the governmental agency), or to impose taxes of the type under consideration?

2.2 Public Purpose

It is equally important to establish that the particular strategy is reasonably designed to accomplish a particular public purpose within the authority of the governmental agency. The Water Pollution Control Act Amendments of 1972 have established the public need and desirability of improving water quality. They have set strict statutory requirements in this regard and have imposed a statutory timetable for the accomplishment of particular water quality objectives.[4] This Federal legislation, and any companion legislation of an individual state,[5] should establish the public nature of the purpose to be achieved by water pollution controls. It will also be necessary to establish that the particular controls imposed are reasonably designed to improve water quality and thus to effectuate that public purpose. In the development of appropriate nonstructural controls to meet this requirement, the following questions are important:

- How does any particular strategy or set of controls operate to improve water quality?
- What is the relationship among the particular property or properties subjected to any controls, the types of pollution sought to be controlled thereby, and the water supply or body sought to be improved or protected thereby?
- How severely does the control or set of controls restrict a property owner's ability to use the land as compared to the necessity of that control or set of controls for the elimination, reduction, or prevention of water pollution?
- With respect to any particular land area, what uses may be made of that land which will not result in increased water polluting activities, or which will reduce the potential for pollution?

- How will these uses eliminate or reduce potential pollution while other disallowed uses would increase pollution potential?

The answer to this last question may be the most crucial. The answer should indicate the difference in potential pollutant generation characteristics of different uses, the relationship of the land area to bodies of surface or groundwater, the availability of other land within the region for uses prohibited at a particular location, and the suitability of that other land for those prohibited uses. To the extent that it is possible, analysis of the nature of the pollution problem and conditions in the area should help to establish the reasonableness of any particular control or set of controls.[6]

2.3 Equal Protection

Even though a particular control is within the authority of the governmental agency, and can be shown reasonably to serve the public purpose of reducing or eliminating the potential for water pollution, it is still necessary that the control or set of controls imposed upon any particular parcel of land will treat similar parcels of land similarly, to the extent that it is possible to classify parcels on the basis of relative potential to generate pollution. Otherwise, a particular landowner may be able to establish that the imposition of the control, as to that owner's land, constitutes a denial of equal protection of the law and is therefore constitutionally invalid.[7] The same questions asked in Section 2.2 can help to establish the equality of treatment afforded similarly situated landowners. The planner, however, should also be prepared to establish that similarly situated parcels are treated similarly. Again, a factual analysis of various types of land within the region may be necessary, or at least extremely helpful, in establishing this fact. The planner should be prepared to answer at least the following questions with respect to the land subject to any particular control or set of controls:

- How does this land differ in conditions relevant to potential water pollution problems, from other land within the region?

- How is it the same in conditions relevant to potential water pollution problems, as other land within the region?

- Are the differences sufficient to justify the imposition of this particular control or set of controls on this particular parcel of land and not upon other land within the region?

2.4 Just Compensation

The power of governmental agencies to control the activities which may occur on land within their jurisdiction is not unlimited. Although the precise location of the limit is by no means an easy one to predict, where a control or set of controls so substantially denies the private owner any or all reasonable use of the land, the particular control often will be held to be invalid as an attempt to "take" the owner's property without making "just compensation" for the loss suffered by the owner, or will impose upon the agency the obligation of compensating the owner for his loss of use.[8] Thus, certain parcels of land which cannot be used reasonably by their private owners without substantially contributing to water pollution may have to be acquired by an appropriate governmental agency through the exercise of eminent domain; while, in less extreme situations, where properties can accommodate restricted, yet reasonable, uses which do not contribute substantially to water pollution, the exercise of eminent domain may not be legally required. The power of eminent domain is the power of the sovereign (Federal or state government) or its delegate to compel an owner of private property to sell some or all of that owner's property rights to the governmental agency at a price which represents "just compensation" for the private owner's loss.

Where adequate authority for the exercise of this power of government exists, there should be no particular problem, in theory, in acquiring the property. Any acquisition will have to be paid for by the acquiring agency at the fair market value of the property or partial interest in property acquired.[9] In addition, the acquiring agency in rare cases may have to establish that the acquisition is for "public use" or a "public purpose" and not for the benefit of some other private party, landowner or future landowner.[10] The same result can be obtained by negotiated purchase of a partial interest from the owner of the property interest.[11]

Common questions which planners should be prepared to answer concerning both (a) regulatory controls to be imposed upon land within jurisdiction, and (b) the acquisition of property where controls alone will be inadequate or otherwise unavailing include:

- What is the state's interpretation of when a regulation so substantially denies a landowner the use and enjoyment of the land that a "taking" has occurred for which compensation must be made?[12]

- Will a particular control or set of controls amount to a "taking" under that interpretation so that the land, or some interests in the land, should be acquired by the exercise of eminent domain?

- If a particular control or set of controls is determined by a court to amount to a "taking," will the court (a) require the governmental agency to compensate the landowner for the loss resulting from compliance with the controls;[13] or (b) declare the control or set of controls invalid?[14]

The effect of the constitutional prohibitions against the "taking" of private property without just compensation by regulations which deprive the private owner of substantially all the beneficial use and enjoyment of that property is commonly referred to as "the taking issue." This is also the title of a recent major study of the impact of the constitutional limitation on the power of government to control land use.[15] Its authors have stated: "Our strongest impression from this survey is that the fear of the taking issue is stronger than the taking clause [of the Federal Constitution] itself."[16] However, they are also careful to point out that "most land use regulations can survive attack in the courts if they are based on sound factual evidence and are carefully drafted."[17] The importance of developing adequate answers to the types of questions raised in Sections 2.2 and 2.3 when a regulatory solution to water pollution problems is sought cannot be overemphasized.

If it is decided to acquire full ownership of the land, or any lesser interest in the land, in order to accomplish planning goals, the planner must be prepared to answer the following questions:

- Does the governmental entity in question possess sufficient authority, either under enabling legislation or by legislative or constitutional grant of home rule powers, to acquire property interests for this purpose?[18]

- Does the governmental entity in question possess sufficient authority under state law to acquire the particular property interest desired?[19]

- What will be the fair market value or "just compensation" required to be paid in acquiring a property or property interest?

- How will acquisition of this particular property or property interest serve the public purpose of eliminating or reducing potential water pollution?

Often, property acquired by the governmental agency may be useful for certain private purposes of a limited nature, even though efforts to restrict private owners to the same uses by regulation alone could be found to amount to a "taking" by the courts. In this situation, with appropriate authority, the agency might be able to resell the land to private owners subject to appropriate restrictions and at an appropriate reduction in price, or to enter into short- or long-term leases of the land with private entities for the same purposes.[20] In this regard, planners should ask whether the governmental agency acquiring the land has the necessary authority to permit private reuse of the land either through resale or leasing.

A possible format for displaying the results of an evaluation of the relative legal feasibility of alternative control policies is presented in Exhibit 2.1.

2.5 Legal Implications of Some Specific Nonstructural Controls

2.5.1 Regulatory Controls

The primary regulatory controls which governmental agencies may exercise in a nonstructural manner are zoning and subdivision controls. Zoning regulations are designed to control the location and intensity of use with reference to particular parcels of land. Subdivision controls operate primarily at the time that new land uses are initiated, enabling the governmental agency in certain situations to require that necessary or appropriate public facilities for the new uses are installed and that land is divided and used in such a manner as to

EXHIBIT 2.1: Format for Evaluating Legal Feasibility of Alternative Pollution Control Policies

Legal Issue	Pollution Control Policy		
	A	B	C
Adequate authority to apply control: Enabling legislation Home rule charter			
Public purpose served by control: Effect of control on water quality Relationship between controlled property, type of pollution, and body of water Severity of restriction on land use Allowable uses which would not impair water quality Means by which allowable uses improve water quality (and disallowed uses deteriorate water quality) Effect of control on objectives other than water quality			
Equal protection under the law: Differences between controlled and uncontrolled property Similarity between controlled and uncontrolled property Sufficiency of observed differences as justification for control			
Just compensation for effects of control: State's interpretation of "taking issue" Degree of "taking" caused by control Need for compensation under eminent domain Authority to exercise eminent domain to acquire property interests Amount of "just compensation" (fair market value) required Public purpose served by acquisition of property interest			

prevent the imposition of certain externalities, including nonpoint source pollution, on the community.[21] Viewed traditionally, these controls have not been regarded as compensating private owners for their losses as much as avoiding the imposition of externalities of certain types on existing land users and potential users of other land in the area.

These techniques are potentially very useful for implementing pollution controls, particularly with respect to the ability of governmental agencies to impose exactions upon developers in return for the granting of development permission. While exactions have been historically limited to subdivision controls, the use of site plan and similar requirements in zoning controls also enables the governmental agency to obtain some public benefits from the granting of private development permission.

In one of the leading subdivision exaction cases, Ayres v. City Council of Los Angeles, 207 P.2d 1 (Cal. 1949), the California supreme court upheld the authority of the City to require a developer to dedicate land to the City for use in widening a major traffic artery bordering one side of the proposed development. The developer was required to dedicate some land as a planting and buffer strip to shield the homes in the development from the highway, and yet additional land for street purposes to facilitate traffic flow around and through the development. The court found that these exactions were not unreasonable and could be required as part of the subdivision approval process despite the fact that they would provide benefits to residents of the City generally and not only to residents of the new development.

Other courts have not taken as liberal a view of a governmental agency's power to require exactions of a developer where the benefit of those exactions will go to the community at large, or where the need to be served by the exactions is created by growth in the general area, rather than the impact of the particular development from which the exactions are demanded. These courts usually require that the exactions be "specifically and uniquely attributable" to the activity from which the exaction is sought and not for the benefit of the general community.

Governmental agencies can use exactions as a part of their permit granting powers[22] to require that private owners seeking development or other regulatory permission provide adequate facilities to serve their developments. Thus, exactions might be employed to require developers to provide facilities to reduce or eliminate threats to the maintenance or improvement of water quality which are created by the activity for which permission is sought. Some examples of situations where exactions might be appropriate would include the requirement of open space for the protection of a water course or aquifer, the installation of runoff collection facilities or surface water drainage basins, and the provision of adequate sewage treatment facilities to meet the needs created by the proposed activity.

The following questions would be appropriate in developing strategies for the imposition of "exaction" controls regardless of the control device which leads to the "exaction":

- What theory has the state used in upholding subdivision exactions? Privilege?[23] Voluntary act of developer?[24] Legitimate police power regulation?[25]
- To what extent can the developer be required to install improvements whose benefit extends to the public at large or to property located beyond that of the particular development?[26]
- Does the state recognize the ability of governmental entities to require the payment of fees in lieu of the dedication or installation of public facilities or other permits?[27]

In addition to these questions, the planner should be able to answer the questions in Section 2.2 with respect to any exactions being demanded of a developer in order to establish that the requirement bears a reasonable relation to the public purpose of avoiding or eliminating water pollution.

2.5.2 Growth Management Controls

A regulatory strategy of particular applicability to water quality protection is the managing of growth within a governmental unit's jurisdiction by limiting changes in land use intensity over time.[28] This strategy may be implemented through the imposition of one or more of the regulatory controls which the governmental unit already possesses:

- Management of the issuance of permits for new developments, e.g., sewer connection permits and subdivision approvals, in relationship to provision of adequate public resources,[29]

- Interim zoning controls and "holding zones" or deferred development zones which allow only limited, low density uses on land within the controlled area,[30]

- Numerical limitations on the number of building permits to be issued or dwelling units to be constructed within a particular area over a given time period,[31] and

- Phasing or coordinating more intensive private land development in accordance with the governmental agency's ability to provide adequate public facilities and services.[32]

These techniques are designed to control the character, volume, and timing of new development. To the extent that the development and more intensive use of land creates water quality problems, these techniques can control growth and permit the development or employment of additional measures to prevent pollution. Water pollution problems also can be avoided by managing growth in ways which will minimize its effect on water quality. Where they have been upheld by the courts, the governmental agency generally has been able to demonstrate that the controls were imposed: (1) to meet a present danger to the community of environmental degradation or a present lack of essential public facilities to accommodate intensive development activity, and (2) to implement a plan or program for resolving that particular problem over a reasonable period of time. Where the governmental unit has not been able to show the existence of these bases for particular development controls, the controls frequently have not been upheld.[33] Successful implementation of a growth management strategy for the reduction or elimination of nonpoint source water pollution problems, therefore, would require that the planner be able to provide adequate answers to questions of the type posed in the preceding parts of this chapter.[34]

Inherent in the concept of growth management (as opposed to growth prevention) is the necessity that the controls be of a temporary, not a permanent, character.[35] Further, the controls should be demonstrably related to other governmental efforts to correct those conditions which support imposition of the controls. Thus, important questions in this area include:

- To what extent can the implementing governmental unit undertake actions to correct the problems which require growth management controls?

- To what extent can it be demonstrated that reasonable efforts are being made to address those problems? For example, are the governmental units planning for new or increased sewage treatment capacities and the extension of sewer lines in a rational manner?

- Is it realistic to assume that those efforts will be implemented within the time limit set forth in the growth management strategies and controls?

An additional word of caution in connection with the implementation of growth management controls is required. The implementing governmental agency should be prepared to demonstrate that the particular controls employed have been imposed to serve the legitimate public purpose of providing for orderly growth in terms of community needs and environmental or other problems. Where these controls are imposed for the purpose only of protecting the status quo and preventing development and growth altogether, their ability to withstand a court challenge is greatly reduced. The courts of many jurisdictions have indicated a suspicion of regulatory controls which have the effect of slowing market-fueled growth patterns and demonstrated an unwillingness to permit these types of controls to be used solely for the purpose of excluding newcomers from the community, or newcomers of a particular socio-economic class.[36] The planner should watch carefully to ensure that this is not the underlying purpose for a governmental unit's imposition of growth management controls.

2.5.3 Eminent Domain Controls

Three uses of eminent domain may be considered in connection with water quality planning.[37] First is the acquisition of the ownership of properties with particular or unique water pollution problems or potential. Second, where appropriate authority exists, governmental agencies may wish to acquire less than the entire ownership of particular properties for the purpose of restricting development in an effort to control potential or present pollution problems.[38] Under this approach, sometimes regarded as the acquisition of "conservation easements," and elsewhere discussed in terms of the acquisition of "development rights,"[39] more strict controls may be imposed upon a landowner for losses in use value resulting from those controls than would be permitted in the absence of compensation. The third, and newest of the techniques -- newest in the United States at least -- is the concept of "land banking."[40] Appropriate governmental entities may wish to acquire the ownership of particularly sensitive properties or in other types of properties and then either resell that land to private owners subject to restrictions designed to accomplish the purposes of water quality planning or lease that land to private enterprise under similar types of restrictions. It may be that the governmental entity would wish to withhold the land from the private market until such time as technology will enable it to be used in a manner which will not contribute to water pollution. This activity is also within the concept of "land banking."

2.5.4 Pricing and Taxation Systems as Controls

The economic costs of undertaking or continuing a particular use of land can have an effect upon the private owner's choice of uses to which the land will be devoted. Several techniques have been developed in recent years to influence that choice. Some techniques are designed to reduce certain costs associated with a use which the governmental agency wishes to encourage. Other techniques seek to increase the cost of certain types of activities, either to discourage the activities altogether or to encourage the activities to internalize certain costs which they otherwise might impose on the other members of the community or region in which they will be located.[41] The efficiency and equity of these techniques are the subject of study and debate today.[42] Nevertheless, they should be considered by the planner in evaluating the range of strategies available to meet water pollution problems and other environmental considerations.

One cost-reducing technique which has grown in popularity in recent years, as the incidence of ad valorem taxes on agricultural and rural land has increased due to the increased value of that land for non-agricultural uses, is the adoption of "preferential assessments." The Council on Environmental Quality reported that by 1974 some form of preferential assessment procedure had been adopted by 33 states.[43] The specifics of the technique vary widely from state to state. Essentially, however, the procedure works as follows: The owner of land which qualifies for preferential assessment -- because of its present or future use for agricultural, silvicultural, open space, or other purposes -- is entitled to have that land assessed for ad valorem tax purposes at its value for that use, not at the value which it would bring if sold on the open market as land available for any type of development. Real estate taxes are imposed at this value rather than the market value. Most states provide that if the land is subsequently converted to purposes other than those for which the preferential assessment is available, some form of penalty or other recoupment payment must be made to the taxing authorities as a rebate of the tax relief granted earlier.

The largest single impediment to the implementation of this strategy is found in the "uniformity clause" of most state constitutions. The clause requires that "all taxes shall be uniform, upon the same subject of classes, within the territorial limits of the authority levying the tax, and shall be levied and collected under general laws."[44] The first question to ask before adopting this strategy is: Can the taxing authorities of the state grant preferential assessments without violating the state constitution? Even where constitutionally permissible, problems of "equal protection" (equal treatment of similarly situated land) may arise, requiring answers to the questions suggested in Section 2.3.

Finally, even where all of the legal problems have been resolved favorably, "preferential assessments" may not offer a wholly satisfactory technique for controlling water pollution problems. Unless the legislation which authorizes preferential assessments limits their preference to operations or activities which are conducted in a manner which will aid in preserving or improving water quality, the preferential treatment will be available to the various designated uses of land regardless of the effect of any particular use on water quality or other environmental factors. For example, most of the preferred uses identified in existing legislation favor activities, such as farming, which may in certain situations be among the largest nonpoint sources of water pollution. Therefore, water quality effects of land uses entitled to preferential ad valorem tax treatment should be examined closely. In some cases, it may be desirable to propose that preferences be limited to those activities whose manner of operation is consistent with efforts to protect water quality.

Several cost-increasing techniques have been subjected to judicial scrutiny in recent years. One of these techniques is the imposition of charges for development permission to aid the charging agency in defraying the increased service or capital costs which the development will impose upon it or upon the landowners and users whose interests it represents. This technique is closely related to the exaction of land under the subdivision procedure discussed in Section 2.5.1. Many of the same considerations apply here, particularly the existence of adequate authority in the permit granting agency to require the payment of a fee as part of the permit granting process. Where adequate authority exists, there are further questions as to the purposes for which fees can be required, the amount of fee which can be required, and the uses to which those fees can be put by the agency.

Among the leading cases upholding the power of a governmental agency, under proper enabling legislation,[45] is Jenad, Inc. v. Village of Scarsdale, 218 N.E.2d 673 (N.Y. 1966). A majority of the members of the New York Court of Appeals, the highest state court in New York, upheld the imposition of a fee of $200 per lot imposed by the Village, to be used for park and recreation purposes, as a condition on the approval of a proposed 24-lot subdivision. The majority placed great emphasis on the fact that the funds could only be used for park and recreation purposes, and did not become part of the general fund of the Village. The limited use was consistent with the enabling legislation, which limited the purposes for which land exactions could be imposed upon developers. Had the Village been able to use the fees for general purposes, the imposition of the fund would have been invalidated as an attempt to levy a tax which was not "uniformly assessed" under New York law.[46]

In Associated Home Bldrs. v. Walnut Creek, 484 P.2d 606 (Cal. 1971), appeal dismissed, 404 U.S. 878, the California supreme court upheld the requirement that a subdivider must either dedicate a specific proportion of its land to designated purposes or pay a fee in lieu of dedication in an amount equal to the value of the land which would have been required by way of dedication. The court emphasized that the legislation, both state and local, under which these requirements were imposed provided adequate standards by which to determine the reasonableness of the exaction or fee, and contained sufficient conditions to assure the developer and ultimate purchasers that they would share in the benefits to be obtained by the community from the exaction or fee payment.

It is important that the agency imposing a fee on new land uses as part of its permit granting power be able to establish the reasonableness of the fee -- its relationship to the public purpose for which it has been imposed[47] and the reasonableness of its amount.[48] Where there exists adequate legislative authority for the imposition of the fee and the requirements of the reasonableness of the specific charge have been established, the trend in judicial decisions appears to be in the direction of upholding fees incident to the permit granting process.[49]

2.5.5 Planning Controls on Governmental Activities

Many governmental activities can have a direct impact upon the use of particular parcels of land although they are not cast in the form of police power regulations or land acquisitions. The location, expansion, or abandonment of public facilities, the tax policy and expenditure policy of a governmental entity are among the most obvious of these activities. Exercise of these powers is subject to the same limitations discussed above as to the existence of power to undertake particular actions and to the requirement that the actions be reasonably related to proper public purposes of the entity.[50]

All governmental decisions are subject to the requirement of "reasonableness."[51] A regulation, the exercise of eminent domain, the imposition of a particular form of taxation or the decision to locate a public facility in a particular area will be invalid if a court determines it was "unreasonable, arbitrary, capricious or an abuse of governmental discretion." In order to establish the "reasonableness" of particular decisions, several related planning or decision review techniques have been developed. These include:

- "Comprehensive plan" requirements,[52]
- Mandatory referral provisions requiring consultation among affected, or potentially affected, agencies as part of certain decision-making processes,[53]
- "Environmental impact statement" requirements for certain types of "major governmental activities," both state and Federal, or other "impact statements" setting forth the potential effect of particular governmental decisions upon a community or other identified interest,[54] and
- "A-95" regional planning agency review of particular local government decisions.[55]

None of these devices should be regarded as ends in themselves. Appropriately identified and employed, they provide the basis for testing the reasonableness of particular governmental decisions. They do not accomplish a discrete result by themselves. Rather, they can aid in determining the selection of specific strategies which will accomplish a particular desired result, as well as establishing that that result is a proper one for the governmental entity to seek to accomplish.

One of the purposes of the A-95 review process, for example, is to ensure that specific expenditures of Federal funds by municipal and other governmental agencies satisfy regional needs or, at least, do not interfere with regional programs or exacerbate regional problems.[56] In each of the other techniques discussed above, the first level of enforcement of the requirement of rationality in governmental decision-making usually occurs in a state or Federal court, where a decision is challenged as irrational, arbitrary or capricious when measured by a comprehensive plan, environmental impact statement, or comment resulting from mandatory referral. Unlike those techniques, however, under A-95 review resort to litigation is not always necessary to ensure proper decision-making at the local or operational level. The A-95 review agency may refuse to approve local project funding applications which are inconsistent with regional needs or regional programs. Thus, A-95 review can impose directly an administrative check on local activity.

The water quality planner should utilize the A-95 review process to ensure that water quality problems, particularly those which can only be addressed through nonstructural control strategies, are considered fully by the review agency prior to approval of projects subject to the agency's review powers. The withholding of approval may be one of the most important strategies available for ensuring that local municipalities and other state agencies do, in fact, adopt and enforce adequate water pollution controls.

Either through the A-95 review agency, or by direct contact with the local regulatory agencies, the planner may also seek to have nonstructural water pollution control strategies added as a component of the comprehensive plan of the municipalities or other regulatory agencies having land use control powers. The inclusion of this element in the comprehensive plan or other base for land use control will serve to direct the exercise of land use control powers at the regulatory agency level and should serve to aid private and public developers in formulating their own land development plans for the area governed by the plan. In this way, the pollution control strategies of the planning agencies and of the regulatory agencies will more closely coincide. The existence of the strategy as an integral part of both processes can provide an important objective against which to test the decisions made in specific cases by the regulatory agency, as well as the impact of specific land development decisions by private and public developers.

A matrix containing general assessments of the present legal status, administrative feasibility, and technical capability of particular nonstructural pollution controls is presented in Exhibit 2.2.

EXHIBIT 2.2: Legal Status, Administrative Feasibility, and Technical Capability of Particular Nonstructural Pollution Controls

Type of Control	Control	Legal Status of Control		Administrative Feasibility of Control				Technical Capability of Control	
		Legal Authority for Control[a]	Judicial Acceptability of Control[b]	Operational Experience with Control[c]	Expertise Required for Implementation[d]	Information Requirements[e]	Monitoring Costs[f]	Water Quality Improvements Produced by Control[g]	Additional Benefits Provided by Control[h]
Land use control	Municipal zoning	1	1	1	1	1	1	1, 2, 3	1, 2, 3
	Planned unit development	1	1	2	2	2	2	1, 2, 3	1, 2, 3
	Cluster development	1	1	2	1	2	2	1, 2, 3	1, 2, 3
	Bonus or intensity zoning	1	1	2	1	2	2	1, 2, 3	1, 2, 3
	Flood plain zoning	1	2	2	2	3	2	1, 2	1, 2, 3
	Development rights transfer	1	3	3	3	2	2	1, 2, 3	1, 2, 3
Performance criteria related to land management	Subdivision regulation	1	1	1	1	1	1	1, 2	1, 2
	Building codes	1	1	1	1	1	1	1, 3	1
	Flood plain and coastal use standards	1	2	2	2	3	3	1, 2, 3	1, 2, 3
	Runoff control standards	1	2	2	2	3	3	1, 3	2
Growth management controls	Sewer moratoria	1	2	2	2	3	3	2	--
	Subdivision moratoria	1, 2	2	3	1	1	1	1, 2	--
	Time-phased issuance of building permits	1, 2	2	3	1	3	1	1, 2, 3	--
	Adequate public facilities ordinances	1	3	2	1	2	2	2	1, 2, 3
	Interim zoning control	1	2	2	1	1	1	1, 2	--
	Holding zones	1, 2	2	3	1	1	1	1, 2	2, 3
Public acquisition of land or interests in land	Eminent domain condemnation	2	1	1	3	3	1	1, 2	1, 2, 3
	Conservation easements	2	1	2	3	3	3	1, 2	1, 2, 3
	Flooding easements	2	1	2	3	3	2	1, 2, 3	1, 2, 3
	Dedication of land	1	2	1	1	1	1	1, 2, 3	1, 2, 3
Pricing and taxation systems	Preferential property tax assessment	3	2	2	2	2	2	1, 2, 3	1, 2, 3
	Development fees and charges	1, 3	2	3	2	3	1	1, 2, 3	1, 2
Planning and review processes	Comprehensive plans	1	1	1	3	3	2	1, 2, 3	1, 2, 3
	Mandatory referral provisions	4	1	2	2	2	2	1, 2, 3	1, 2, 3
	Environmental impact statements	4	1	2	3	3	1	1, 2, 3	1, 2, 3
	A-95 review	4	3	1	3	2	2	1, 2, 3	1, 2, 3

[a] Key: 1 = police power, 2 = eminent domain, 3 = taxing power,
4 = inherent limitation on governmental discretion.

[b] Key: 1 = generally acceptable, 2 = favorable judicial trend noted,
3 = insufficient judicial response to evaluate.

[c] Key: 1 = extensive, 2 = moderate, 3 = limited.

[d] Key: 1 = limited, 2 = moderate, 3 = extensive.

[e] Key: 1 = limited, 2 = moderate, 3 = extensive.

[f] Key: 1 = low, 2 = moderate, 3 = high

[g] Key: 1 = can reduce stormwater runoff,
2 = can reduce generation of pollutants,
3 = can increase technical feasibility of structural pollution control.

[h] Key: 1 = can increase air quality,
2 = can increase social return from public facilities,
3 = can improve the aesthetic quality of the site.

NOTES

1. See Hagman, *Urban Planning and Land Development Law* §§33-40 (West Pub. Co. 1971), hereafter cited as Hagman §____. (A summary of the contents of this book and its 1975 supplement is presented as an appendix to this manual.) For some illustrative cases, see Fairfax County v. Horne, 215 S.E. 2d 453 (Va. 1975); Fairfax County v. De Groff Ent., 198 S.E. 2d 600 (Va. 1974) (alternate holding), noted 35 *U. Pitt. L. Rev*. 837 (1974); Lutz v. Longview, 520 P.2d 1374 (Wash. 1974); Kline v. Harrisburg, 68 A.2d 182 (Pa. 1949).

2. See Hagman §41. For an illustrative case, see Blackman v. City of Big Sandy, Texas, 507 F.2d 935 (5th Cir. 1975).

3. See Hagman §§93 and 96. For some illustrative cases, see Allman v. Fairfax County, 211 S.E. 2d 48 (Va. 1975); United Farmworkers of Florida Hsg. Project, Inc. v. City of Del Ray Beach, 403 F.2d 799 (5th Cir. 1974).

4. 86 Stat. 816, 33 U.S.C. §§1251 and 1311(b).

5. *E.g.*, West's Calif. Code Annotated, Water Code, §§13000 et seq., esp. §§13370 and 13371 (Supp. 1975); and Purdon's Pa. Statutes Annotated, title 35, §§691.1 et seq., esp. §691.4 (Supp. 1975).

6. For a description of the development of an environmental information system for land use planning purposes in San Diego County, California, and the application of that system to a specific development proposal, see John Lyle and Mark von Wodke, "An Information System for Environmental Planning," 40 *J.A.I.P.* 349 (1974); see also American Institute of Planners, *The Comprehensive Plan and the Environmental Impact Statement Process*, prepared for Environmental Protection Agency by John C. Keene, Paul H. Sedway, and Harold F. Wise, 1975, pp. 52-54 and Appendix B, pp. B-11 through B-24, for an example of the way in which the development of more adequate environmental data resulted in more rational and efficient land development.

7. See materials cited in n. 3, *supra*.

8. Hagman §§180 and 181; Pennsylvania Coal Co. v. Mahon, 260 U.S. 393 (1922); and see cases and materials cited in nn. 13 and 14, *infra*; but see: Goldblatt v. Town of Hempstead, 369 U.S. 590

(1962); Sibson v. State, 363 A.2d 239 (N.H. 1975); Just v. Marinette County, 201 N.W. 2d 761 (Wis. 1972); Bosselman, Callies and Banta, *The Taking Issue* (1973); Sax, "Takings, Private Property and Public Rights," 81 *Yale L.J.* 149 (1971); CONSAD Research Corporation, *Economic Incentives for Land Use Control*, final report prepared for Environmental Protection Agency, Office of Research and Development, under Contract Number 68-01-2699, April 12, 1976, Section 2.2.

9. Hagman §183.

10. Hagman §176.

11. E.g., United States v. Albrecht, 496 F.2d 906 (8th Cir. 1974).

12. *Compare* Sibson v. State and Just v. Marinette County, both cited in n. 8, *supra*, *with* Dooley v. Town Pl. and Zone Comm'n of Town of Fairfield, 197 A.2d 770 (Conn. 1964).

13. See Hagman §§180 to 182. For some illustrative cases, see United States v. Causby, 328 U.S. 256 (1946) and Griggs v. Allegheny County, 369 U.S. 84 (1962); Kansas City v. Kindle, 466 S.W.2d 807 (Mo. 1969); Lomarch Corp. v. Mayor of Englewood, 237 A.2d 881 (N.J. 1968); Sveed v. County of Riverside, 32 Cal. Rptr. 318 (Cal. App. Ct. 1963) [but cf. Morse v. County of San Luis Obispo, 55 Cal. Rptr. 710 (Cal. App. Ct. 1967)]; State *ex rel*. Madsen v. Houghton, 23 N.W. 831 (Minn. 1930); Piper v. Ekern, 194 N.W. 159 (Wis. 1923). See also Annot. 41 *A.L.R*. 3d 636.

14. See Hagman §§50 and 144. For some illustrative cases, see Pennsylvania Coal Co. v. Mahon, cited in n. 8, *supra*; Commonwealth, Dep't. of Env. Resources v. Trautner, 388 A.2d 718 (Pa. intermediate court 1975); C. Lombardi Bldrs., Inc. v. Stein, 358 N.Y.S. 2d 113 (N.Y. intermediate court 1974); Dooley v. Town Pl. and Zone Comm'n. of Town of Fairfield, cited in n. 12, *supra*, and see generally, Bosselman *et al.*, *op*. *cit*., cited in n. 8, *supra*, Chap. 9, for a lengthy discussion of cases and for the authors' opinion of the current judicial trend.

15. Bosselman, *et al.*, n. 8, *supra*. But see Lutheran Church in America v. City of New York, 315 N.E.2d 305 (N.Y. 1974) for evidence that the "taking issue" is still very much alive.

16. Bosselman, *et al.*, *op. cit.*, cited in n. 8 *supra*, p. 318.

17. *Ibid.*, p. 326.

18. Hagman §§174 to 177.

19. A rule of construction applied by many courts to the delegation of the power of eminent domain by the state to other governmental entities restricts the scope of that delegated power to the acquisition of the "least interest" in property needed to accomplish the public purpose. 3 Nichols, *Eminent Domain* 269-72 (Rev. 3d ed. 1965). For a case holding that the acquiring agency possessed the power to condemn a "conservation easement," see County of Ocean v. Stockhold, 323 A.2d 515 (N.J. intermediate court 1974); and see cases cited in n. 38, *infra*.

20. For an excellent discussion of the concepts and potential legal issues involved in land banking, see American Law Institute, *Model Land Development Code, Proposed Official Draft No. 2*, Art. 6, "Land Banking," the "Reporters' Commentary" and comments to Article 6 and materials cited therein. Article 6 was adopted without change as the position of the Institute at its annual meeting in May 1975, when the official version of the Code was approved formally.

21. For a more thorough discussion of these controls, see CONSAD Research Corporation, *Economic Incentives for Land Use Control*, final report prepared for the Environmental Protection Agency, Office of Research and Development, under Contract Number 68-01-2699, April 12, 1976, Section 3.1.

22. For illustrative cases applying the principles of subdivision exactions to the imposition of similar requirements under other land use regulatory powers, *compare* Gerla v. City of Tacoma, 533 P.2d 416 (Wash. intermediate court 1975) (exaction upheld as reasonably related to the impact of the proposed use on traffic), *with* Transamerica Title Ins. Co. v. City of Tucson, 533 P.2d 693 (Ariz. 1975) (exaction invalid where not related to any change in impact of development on surrounding neighborhood).

23. Hagman §§136 and 138. For an illustrative case, see Richfield Land Co. v. Detroit, 217 N.W. 55 (Mich. 1928).

24. Hagman §138.

25. Hagman §138. For illustrative cases, see Isabelle v. Town of Newbury, 321 A.2d 570 (N.H. 1974); and Ayres v. City Council of Los Angeles, 207 P.2d 1 (Cal. 1949).

26. Hagman §138. *Compare* Ayres v. City Council of Los Angeles, cited in n. 25, *supra*, and Associated Home Builders of Greater East Bay, Inc. v. City of Walnut Creek, 484 P.2d 606 (Cal. 1971), appeal dismissed, 404 U.S. 878, *with* Pioneer Tr. and Svgs. Bank, 176 N.E.2d 799 (Ill. 1961) and KBW, Inc. v. Town of Bennington, 342 A.2d 653 (N.H. 1975); and see Divan Bldrs., Inc. v. Planning Bd. of Twp. of Wayne, 334 A.2d 30 (N.J. 1975) (establishing a "rational nexus" test for subdivision exactions somewhere between the liberal California position which allows exactions where their relationship to the general welfare of the community can be established, and the restrictive requirement of Illinois and New Hampshire that any exaction be justified as meeting needs "specifically and uniquely attributable to" the proposed development activity upon which the exaction requirements has been imposed).

27. Hagman §138. For some illustrative cases, *compare* Gulest Associates, Inc. v. Town of Newburgh, 209 N.Y.S.2d 729 and 225 N.Y.S. 2d 538 (N.Y. intermediate court 1966) *with* Jenad, Inc. v. Village of Scarsdale, 218 N.E.2d 673 (N.Y. 1966); and see Jordan v. Menomonee Falls, 137 N.W.2d 442 (Wis. 1965) and Billings Properties, Inc. v. Yellowstone County, 394 P.2d 182 (Mont. 1964). But cf. Andres v. Village of Flossmoor, 304 N.E.2d 700 (Ill. 1974) and Gordon v. Village of Wayne, 121 N.W. 2d 823 (Mich. 1960).

28. See generally, D. Falk and H. Franklin, *Local Growth Management: A Legal Primer* (Potomac Inst. 1975); Urban Land Institute, *Management and Control of Growth* (3 vols., Washington, D.C., 1975); R. Freilich, "Development Timing, Moratoria and Controlling Growth," *1974 Institute on Planning, Zoning and Eminent Domain* 174 (Southwest Legal Foundation 1974); "Note, Control of the Timing and Location of Government Utility Extensions," 26 *Stanford L. Rev.* 945 (1974); H. Franklin, *Controlling Urban Growth - But for Whom?* (Potomac Inst. 1973); F. Bosselman, "Can the Town of Ramapo Pass A Law to Bind the World?" 1 *Fla. St. Univ. L. Rev.* 65 (1973); R. Freilich, "Interim Development Controls: Essential Tools for Implementing Flexible Selective Planning and Zoning," 49 *J. Urban Law* 65 (1971).

29. For some illustrative cases, see New Jersey Shore Bldrs. Ass'n v. Township of Ocean, 319 A. 225 (N.J. intermediate court 1974) and Commonwealth v. Borough of Carlisle, 330 A.2d 293 (Pa. intermediate court 1974).

30. See Hagman §§40 and 119. For some illustrative cases, see Cappture Rlty. Corp. v. Board of Adj. of Borough of Elmwood Park, 336 A.2d 30 (N.J. intermediate court 1974); Ridge Realty Co. v. Oldham County, 497 S.W.2d 432 (Ky. 1973); State v. Lomish County, 488 P.2d 511 (Wash. 1971) [but see Byers v. Board of Clallam County Commrs., 529 P.2d 823 (Wash. 1974)].

31. For some illustrative cases, see Construction Industry Ass'n v. City of Petaluma, 522 F.2d 897 (9th Cir. 1975) rev'g 375 F. Supp. 574 (N.D. Cal. 1974) and Collura v. Town of Arlington, 329 N.E.2d 733 (Mass. 1975).

32. For some illustrative cases, see Builders Ass'n of Santa Clara/Santa Cruz Counties v. Superior Court, 529 P.2d 582 (Cal. intermediate court 1974) and Golden v. Planning Bd. of Town of Ramapo, 285 N.E.2d 291, appeal dismissed, 409 U.S. 1003 (N.Y. 1972). The Ramapo decision is considered a landmark in the development of growth management controls.

33. See Charles v. Diamond, 345 N.Y.S.2d 764 (N.Y. intermediate court 1974) and Belle Harbor Rlty. Corp. v. Kerr, 350 N.Y.S.2d 698 (N.Y. intermediate court 1973); but see C. Lombardi Bldrs., Inc. v. Stein, 358 N.Y.S.2d 193 (N.Y. intermediate court 1974).

34. For some illustrative cases holding that the governmental unit lacked the power to adopt particular interim controls, see Board of Supervisors of Fairfax County v. Horne, 215 S.E.2d 453 (Va. 1975); Bryant Devel. Ass'n v. Dagel, 531 P.2d 1320 (Mont. 1975) and Byers v. Board of Clallam County Commrs., 529 P.2d 823 (Wash. 1974).

35. Golden v. Planning Board of Town of Ramapo, 285 N.E. 291, appeal dismissed, 409 U.S. 1003 (N.Y. 1972) (maximum 18 year restriction on growth in certain areas of the municipality upheld).

36. See Ogo Asstes. v. City of Torrance, 112 Cal. Rptr. 761 (Cal. intermediate court 1974). The following quotation from Golden v. Planning Board of Town of Ramapo, n. 34, _supra_, is illustrative of the judicial attitude:

> What we will not countenance, then, under any guise, is community efforts at immunization or exclusion. But, far from being exclusionary, the present [controls] merely seek, by the implementation of sequential development and timed growth, to provide a balanced cohesive community dedicated to the efficient utilization of land. The restrictions conform to the community's considered land use policies as expressed in its comprehensive plan and represent a bona fide effort to maximize population density consistent with orderly growth. . . .
>
> Perhaps even more importantly, timed growth, unlike the minimum lot requirements recently struck down by the Pennsylvania Supreme Court as exclusionary, does not impose permanent restrictions upon land use. . . its obvious purpose is to prevent premature subdivision absent essential municipal facilities and to insure continuous development consistent with the Town's obligation to provide such facilities. They seek, not to freeze population at present levels but to maximize growth by the efficient use of land, and in so doing testify to this community's continuing role in population assimilation.

37. For a more thorough discussion of eminent domain, see CONSAD Research Corporation, *Economic Incentives for Land Use Control*, final report prepared for the Environmental Protection Agency, Office of Research and Development, under Contract Number 68-01-2699, April 12, 1976, Section 3.2.

38. See Hagman §178. For a theoretical economic analysis of this technique, see CONSAD Research Corporation, *Economic Incentives for Land Use Control*, final report prepared for the Environmental Protection Agency, Office of Research and Development, under Contract Number 68-01-2699, April 12, 1976, Section 5.5. For some illustrative cases, see Finks v. Maine St. Highway Comm'n, 328 A.2d 793 (Me. 1974); United States v. Albrecht, cited in n. 11 *supra*; County of Ocean v. Stockhold, cited in n. 19 *supra*; Kamrowski v. State, 142 N.W.2d 793 (1966).

39. See J. Costonis, *Space Adrift: Landmark Preservation and the Marketplace* (Univ. of Illinois Press 1974); J. Costonis, "Development Rights Transfer: An Exploratory Essay," 83 *Yale L. J.* 75 (1973); but cf. Lutheran Church in America v. City of New York, 315 N.E.2d 305 (N.Y. 1974).

40. See n. 18, *supra*.

41. For a theoretical economic analysis of several techniques of these types, see CONSAD Research Corporation, *Economic Incentives for Land Use Control*, final report prepared for the Environmental Protection Agency, Office of Research and Development, under Contract Number 68-01-2699, April 12, 1976, Sections 5.1, 5.2, and 5.3.

42. Land Use (Council on Environmental Quality 1974), pp. 64-68, and materials cited in * on p. 5.8, *infra*.

43. *Ibid*., at p. 66.

44. E.g., Pa. Constitution, art. VIII §1; see also Hagman, "Open Space Planning and Property Taxation - Some Suggestions," 1964 *Wis. L. Rev*. 628, 640.

45. Compare West Park Ave., Inc. v. Township of Ocean, 224 A.2d 1 (N.J. 1966) (fee for educational facilities held invalid for want of statutory authority).

46. See Gulest Asstes., Inc. v. Town of Newburg, 209 N.Y.S.2d 729 (N.Y. intermediate court 1960).

47. See Aunt Hack Ridge Estates, Inc. v. Town of Danbury, 273 A.2d 880 (Conn. 1970) (per lot fees for park purposes upheld under the "uniquely attributable" test discussed in n. 26 and accompanying text, *supra*.).

48. Andres v. Village of Flossmore, 304 N.E. 2d 700 (Ill. 1974) (fee of $1,000 per dwelling unit invalidated for lack of any rational basis for amount).

49. For some illustrative cases, see Torse Bros. Const. Corp. v. Village of Monroe, 366 N.Y.S.2d 810 (trial court 1975); Divan Bldrs., Inc. v. Planning Bd. of Twp. of Wayne, n. 26, *supra*, and cases cited n. 47, *supra*.

50. In addition, there may further be state constitutional or statutory limitations on certain of these activities. See Hagman §189 for a discussion of the common "uniformity" limitation on real property taxation.

51. See discussion and notes, §§2.2, 2.3, and 2.5.1, *supra*.

52. Hagman §§13 to 24; *Standard State Zoning Enabling Act*, §3 (U.S. Dept. of Commerce, 1926 ed.); and see Haar, "The Master Plan: An Impermanent Constitution," 20 *Law & Cont. Probs*. 353 (1955).

53. E.g., Purdon's Pa. Statutes Annotated, title 671 §512(b) (Supp. 1975) (State highway location decisions).

54. E.g., National Environmental Policy Act, 42 U.S.C. §4332(2)(c) (1971); California Environmental Quality Act, West's Calif. Code Annotated, Cal. Pub. Res. Code §§21000-21551 (Supp. 1975). See Friends of Mamouth v. Board of Supervisors of Mono County, 502 P.2d 1049 (Calif. 1972); and see Fox, "Environmental Protection - A Constitutional Limitation on the Land Use Control Powers of Pennsylvania Municipalities," 36 *U. Pitt. L. Rev*. 255, 268-71 (1974); Hagman, "NEPA's Progeny Inhabit the States - Were the Genes Defective?" *1974 Urban Law Ann*. 3.

55. Office of Management and Budget, Circular A-95.

56. For a description of the A-95 review process and its relationships to the comprehensive plan, see American Institute of Planners, n. 6, *supra*, at pp. 17-18 and 41-43.

3.0 EVALUATING THE COST-EFFECTIVENESS OF NONSTRUCTURAL POLLUTION CONTROLS

Cost-effectiveness analysis is a technique to determine which alternative means to attain a specified objective will satisfy the objective at minimum total resource cost over time. In the context of water quality management planning, cost-effectiveness analysis can be employed to determine which alternative approach to pollution control requires the minimum total resource costs over time to attain a particular Federal, state, or local water quality objective.

As stated in the introductory chapter of this manual, the application of cost-effectiveness analysis to the development and implementation of water quality management policies consists of:

- Delineating water quality objectives;*

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*Water quality objectives are specified in terms of water quality standards, which are determined outside the context of cost-effectiveness analysis. The standards, however, establish the basis for cost-effectiveness analysis by defining the objectives against which alternative courses of action must be evaluated. The specification of water quality objectives should be consistent with Section 303 of the Federal Water Pollution Control Act Amendments of 1972; with water quality revision regulations as published in 40FR55340-41, November 28, 1975; and with the process outlined in Guidelines for Areawide Waste Treatment Management Planning, August, 1975, pp. 3-4 to 3-16.

Acceptance of water quality standards as the objective against which alternatives are evaluated reflects the major distinction between cost-effectiveness analysis and cost-benefit analysis. One writer has noted, "Cost-effectiveness studies differ from cost-benefit studies in that: (1) certain basic objectives are taken as given and (2) no attempt is made to quantify all benefits in dollars." (John Haldi, "Issues in Analysis of Cost-Effectiveness Studies for Civilian Agencies of the Federal Government," in David Cleland and William R. King, eds., Systems, Organizations, Analysis, Management: A Book of Readings, New York, McGraw-Hill Book Company, Inc., 1969)

- Identifying alternative structural and nonstructural pollution control methods which are technically capable of attaining the specified water quality objectives;*
- Systematically screening the identified alternative methods to eliminate those which are legally infeasible or politically unacceptable;
- Initially assessing the screened alternatives to determine which methods are potentially cost-effective, and, hence, should be fully evaluated according to the detailed cost-effectiveness analysis procedures;
- Estimating the total resource cost which will be incurred over time by all members of society if each alternative potentially cost-effective method is actually implemented;
- Evaluating the effectiveness of each alternative method in terms of certainty of effect, reliability, flexibility, etc.; and
- Designating as the most cost-effective pollution control method the alternative method determined by the analysis to require the minimum total resource cost over time without generating overriding adverse effects upon the distribution of employment, income, wealth, or tax bases.

This chapter outlines a procedure for evaluating the total resource costs of nonstructural control methods and techniques for estimating these costs. Such estimates are necessary to permit the comparison of all acceptable alternative pollution control methods and, hence, the selection of the most cost-effective method. Consequently, the emphasis in this chapter focuses on the costs of nonstructural pollution controls, and deals only indirectly with their benefits.

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*For sources of information on technical feasibility, consult the bibliography in Guidelines for Areawide Waste Treatment Management Planning, August, 1975.

All alternative pollution control methods -- structural, nonstructural, and mixed -- which are intended to achieve the same water quality objective should produce approximately equivalent direct water-quality-related benefits. As a result, an attempt to quantify the water-quality-related benefits of each alternative is unnecessary and, in the context of cost-effectiveness analysis, inappropriate. However, non-water-quality-related benefits may vary among alternatives which have similar effects on water quality. It is important to recognize this variation, as it may have a determining influence on the selection of the most cost-effective alternative.

For example, by inducing modification of the physical configuration of a property and/or the structures on the property, a nonstructural control method can improve the property's aesthetic appearance. By changing the pattern of development on the property, the method can also reduce the cost of providing public facilities and services to the property.* To the extent that such non-water-quality-related benefits can be assigned a value, they should be subtracted from the total resource cost of the method to arrive at an estimate of its net cost. The procedure outlined in this chapter follows this approach.

3.1 The Private Costs and Benefits of Nonstructural Pollution Control

The scope of cost-effectiveness analysis appropriate for a given control measure will differ depending on whether the control is (1) an across-the-board requirement, or (2) meant to apply on a case-by-case basis. For example, if a proposed control involves a permit program for construction activities which will apply to all new development, the cost-effectiveness analysis should consider the total impact of the permit process on all affected properties. Under such circumstances, the cost-effectiveness analysis would be an effort to determine whether the control should be established. On the other hand, if application of a control depends on the specific situation, the analysis would be undertaken only with respect to application of the control to the particular site involved. In most cases, it would be inappropriate to apply cost-effectiveness analysis to passage of enabling legislation, since enactment is simply a prerequisite to design and application of a control, and further action will be required to apply the control.* In such situations, cost-effectiveness analysis should be applied to the further action necessary to implement the control.

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*For a fuller discussion of these issues, see CONSAD Research Corporation, Economic Incentives for Land Use Control, final report prepared for the Environmental Protection Agency, Office of Research and Development, under Contract Number 68-01-2699, April 12, 1976, Section 2.1 and Chapter 4.0; and Real Estate Research Corporation, The Costs of Sprawl, prepared for CEQ, EPA, HUD, Washington, D.C., U. S. Government Printing Office, April, 1974, GPO Stock Number 4111-00021.

The private costs and benefits of a nonstructural pollution control are the costs incurred and the benefits obtained, as a result of the control, by the owners of the properties to which the control is applied. All costs and benefits which accrue to other individuals or to society at large as a result of the control constitute social costs and benefits of the control.

3.1.1 The Cost of Modifying Land Use Activities

For the application of a nonstructural pollution control to be effective in improving water quality, compliance with the control must entail modification of either the nature or the intensity of the activity which now is or in the future will be performed on the controlled property in a manner which reduces the discharge of pollutants from the property. In providing the desired improvement in water quality, the owner of the property will invariably be required to absorb some cost. This will be true even when compliance with the control involves no expenditure for modifying the physical configuration of either the property itself or any structure on it, as when a property owner conforms to a control by merely reducing the intensity with which he performs his existing activity on his land.

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*This is not to imply that the enabling action itself is costless, or that it will not affect land values. Its passage may involve costs, and anticipation of its application may affect land values. The former point is discussed in Section 3.2.1.

The economic theory of location and land use demonstrates that, prior to the application of a new control to any parcel of land, the activity performed on the parcel must maximize the market value of the parcel, subject to all existing controls upon the use of the property. Unless this condition is fulfilled, some individual, recognizing an opportunity to improve his economic position, could purchase the property at its prevailing market price, and initiate a more valuable permissible activity on it. In this manner, he could increase both the property's market value and his personal wealth. Moreover, this procedure could be repeated until all opportunities to increase the personal wealth of potential owners of the property have been exhausted. At this time, the activity that maximizes the property's market value, subject to existing controls, would probably be located on the parcel.

In this situation, other things being equal, any additional control on the parcel would restrict the performance of the activity which maximizes the property's value and, hence, result in a market value for the property less than the value prevailing prior to the additional control. This reduction in the market value of the controlled property, resulting from an additional nonstructural control, is a valid measure of the private cost of the additional control.

3.1.2 The Cost of Complying with Administrative Requirements

Moreover, it is important to recognize that, if potential users of a controlled property are fully aware of the restrictions that the control imposes on their ability to develop the property, the change in its market value should include the developer's anticipated costs of complying with the administrative review requirements which must be fulfilled to obtain permission for development. For example, any potential user of a controlled property might be required to submit analytical studies supporting a proposed development and, thus, absorb the cost of delay in the initiation of development. Recognizing these requirements, he can be expected to decrease the price that he would be willing to pay for the property. Consequently, the market value of the property would decrease by the sum of the cost of preparing and submitting the analytical studies, and the cost of the delay in development.

If it is possible to provide an acceptable estimate of the total amount that a property's market value will be changed as a result of a control policy, an independent estimation of the costs of complying with the administrative review requirements is unnecessary. In fact, the inclusion of these independent cost estimates in an analysis of the cost-effectiveness of the control policy will constitute double-counting of these costs.

However, if it is only possible to estimate the amount by which the market value of a property will change as a result of the modification of activity induced by the control policy, the estimated change in market value will not incorporate any of the costs of complying with administrative review requirements. Under these circumstances, it is necessary to provide an independent estimate of the cost of complying with review requirements, and to include this estimate in the analysis of the cost-effectiveness of the control. Specifically, it is necessary to provide estimates of the expected values of:

- The administrative fees which must be paid when a request for permission to develop the property is submitted to the implementing agency;
- The cost of preparing and submitting analytical studies supporting the proposal to develop the property;
- The cost of public relations efforts to obtain public support for the proposed development of the property;
- The cost of hiring expert legal, technical, economic, and planning consultants to support the proposed development of the property in public hearings;
- The cost of pursuing litigation to challenge adverse administrative decisions; and
- The costs associated with the delays in the initiation and progress of the development of the property caused by the administrative review process.

However, it is important to recognize that, whenever it is necessary to produce independent estimates of the expected values of the preceding costs, the only costs which should be estimated are the costs that would not have been incurred in the absence of the administrative review requirements. In many cases, substantial portions of these costs would have been incurred even in the absence of the proposed control and, hence, will require no additional expenditures. It is important to recognize that all of these cost elements should be evaluated as incremental, rather than total, costs.

3.1.3 The Benefit of an Integrated Control Policy

In many instances, a proposed control may replace, rather than supplement or complement, existing controls. The relaxation of any existing control might allow an activity which establishes a greater market value for a property than the value prevailing prior to the relaxation of the control. If non-water-quality-related objectives of established land use controls are not compromised in the process, the effect of achieving the water quality objectives on the market value of the property can be mitigated by adopting a pollution control policy consisting of both the adoption of additional pollution controls and the relaxation of existing land use controls. For example, in some situations, water quality objectives might be achieved without sacrificing the attainment of non-water-quality-related objectives by replacing traditional density zoning controls with planned unit development or cluster zoning controls. The effect of an integrated policy of this type on the market value of the controlled property would almost always be less adverse than the effect on market value of the pollution controls in a non-integrated policy. Therefore, it is very important to investigate the possibility of relaxing existing land use controls whenever the implementation of additional pollution controls is considered. The private cost of an integrated pollution control policy would be measured as the net change in the market value of the controlled property caused by the application of the control policy.

3.1.4 The Benefit of Environmental Improvements

The net change in the market value of the controlled property may also be influenced, to some extent, by the benefits obtained by society from the environmental improvements produced by the control.* For example, if the implementation of the control improves the aesthetic quality of the environment surrounding the controlled property or increases the quality of the environmental resources used by the activity performed on the property, the value of these benefits should be reflected, in some degree, in an increased market value of the property.

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*Empirical evidence of the influence of improvements in water quality on property values is presented in Elizabeth L. David, "Lakeshore Property Values: A Guide to Public Investment in Recreation," Water Resources Research, Vol. 4, August, 1968, pp. 697-707, and in Jack L. Knetsch, "The Influence of Reservoir Projects on Land Values," Journal of Farm Economics, Vol. 46, February, 1964, pp. 520-538. Similarly, Robert J. Anderson and Thomas D. Crocker, "Air Pollution and Residential Property Values," Urban Studies, Vol. 8, October, 1971, pp. 171-180; Ronald G. Ridker and John A. Henning, "The Determinants

3.2 The Social Costs and Benefits of Nonstructural Pollution Controls

In addition to the private costs and benefits obtained by the owner of a property subject to a pollution control, there are several other costs and benefits borne by other members of society. The administration of the control policy imposes costs upon the agency responsible for the policy's administration. The responsible agency incurs costs in two contexts: the establishment of an administrative process for the control, and the application of this administrative process in particular situations. At the same time, the control may provide benefits to individuals not owning the controlled properties who value the improvements produced by the control.

3.2.1 The Cost of Establishing the Control and the Administrative Process for Its Implementation

Public agencies may have to incur costs both to develop, through law and/or judicial test, the capability to impose the control, and to establish an administrative process for its implementation. The costs of establishing the control may include:

- Any additional costs incurred in drafting legislative language;
- The costs of public hearings and presentations, if any; and

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of Residential Property Values with Special Reference to Air Pollution," Review of Economics and Statistics, Vol. 49, May, 1969, pp. 246-257; and Kenneth F. Weiand, "Air Pollution and Property Values: A Study of the St. Louis Area," Journal of Regional Science, Vol. 13, April, 1973, pp. 91-95, empirically demonstrate the influence of air quality on property values.

- The costs of preparing the case supporting the control and presenting the case in court.

Two considerations are important in determining whether these costs are significant enough to warrant attempts at quantification. First, the legality of the control may already be established. To the extent that the associated costs have already been incurred, they are not appropriately considered as costs attributable to the control. Second, even where such costs have not already been incurred, it may be inappropriate to assign the full costs to the action being considered. In terms of effects on the costs related to establishing the control, it may make no difference whether the control is applied in one circumstance or many. The full costs of establishing the control, therefore, should not be attributed to any particular application of the control unless that application is expected to be the only one in the foreseeable future. Otherwise, for the purpose of the cost-effectiveness analysis, the costs of establishing the control in any given situation should be spread over all applications of the control.

The costs of establishing an administrative process may include:

- The cost of formulating the structure of the administrative process;

- The cost of restructuring the assignments of existing staff members to accommodate their responsibilities in the operation of the administrative process; and

- The cost of acquiring new staff members and training them to perform their assigned functions in the operation of the administrative process.

Often, these costs will be minimal, since many agencies can administer most control techniques with minor changes in the responsibilities of their existing staffs. For those control techniques requiring substantial restructuring and expansion of an agency's staff, however, the agency should carefully assess the cost of establishing administrative processes for the controls.

It is important to recognize that, while the cost of establishing an administrative framework for a control may be substantial, this cost is relevant only to the evaluation of whether it is desirable to develop the capability to implement the control. It is not relevant to the evaluation of the cost-effectiveness of implementing the control in a particular situation. In general, when an agency is considering the application of a control, it may have already absorbed the cost of establishing the administrative framework for the implementation of the control, and will be unable to recover any portion of this cost regardless of its decision concerning the application of the control. In such cases, the cost of establishing the administrative framework for a control is a sunk cost relative to any decision concerning the application of the control, and it is irrelevant to the evaluation of the cost-effectiveness of applying the control in any particular situation.

3.2.2 The Cost of Applying the Administrative Process

Although the cost of establishing an administrative process for a control is a sunk cost relative to any decision concerning the application of the control to a particular property, the cost of applying the administrative process can be avoided by deciding not to impose the control on the property. Consequently, the cost of applying the administrative process in a particular situation is relevant to the evaluation of the cost-effectiveness of imposing the control in this situation. The total cost of applying an administrative process to a particular property consists of:

- The cost of overseeing the application of the review procedures of the administrative process to proposals for the development of the property,
- The cost of preparing analytical studies evaluating these proposals for the development of the property,
- The cost of providing a legal defense for the denial of proposals for the development of the property which users of the property decide to challenge in court,
- The cost of monitoring and enforcing the compliance of the activities performed on the property with the stipulations of the control, less
- The administrative fees which must be paid by potential developers of the property when submitting requests for permission to develop the property.

The administrative fees must be deducted from the other elements of the cost of the administrative process, since the fees will be automatically included in the change in the market value of the controlled property. Hence, the failure to deduct the fees from the other elements of the total cost would count the fees twice.

3.2.3 The Social Benefits of Nonstructural Pollution Controls

People obtain benefits from a nonstructural pollution control in the form of the improved water quality provided by the application of the control. Also, since nonstructural pollution controls generally can be used to promote other environmental quality objectives in addition to the improvement of water quality, society frequently will receive other benefits from improvements in environmental attributes other than water quality as a result of a control. For example, a control may also provide benefits in the form of an improvement in air quality, or an enhancement of the aesthetic characteristics of the controlled property.

Any property whose location permits its users to obtain a portion of the benefits of the technical or aesthetic improvements in water quality or other environmental attributes produced by a control should experience an increase in its market value as a result of the capitalization of these benefits. The increase in the market value of properties other than the controlled property, attributable to improvements produced by the control, measures a portion of the benefits obtained by society from the control. However, in most cases, the preponderance of benefits will neither accrue to specific properties nor be readily measurable. Primarily for these reasons, it is usually impractical to perform cost-benefit analysis; and, hence, cost-effectiveness analysis is the most practical approach to comparing nonstructural and structural controls. Where increases in property values can be estimated, of course, they should be.

By estimating the size of the increase in the market value of uncontrolled properties attributable to the improvements in environmental quality produced by a control and comparing this increase in market value to the sum of the estimated net private and social costs of the control, an assessment of the desirability of applying the control can be produced. This assessment is the best indicator of the desirability of a control which is attainable without a detailed analysis of all benefits produced by the control, including those not reflected in increased property values. Assessments of this type provide a strong basis for the determination of the best pollution control to apply in any particular situation.

3.3 Summary: Evaluating the Cost of a Nonstructural Pollution Control

In evaluating the social desirability of using any nonstructural pollution control, an analyst must address two separate issues: the desirability of developing the administrative capability to implement the control, and the desirability of applying the control in particular situations.

To assess the desirability of developing the administrative capability to implement a control, the agency should consider:

- The estimated cost of establishing an administrative process for the implementation of the control.

Since, in general, the cost of establishing the administrative framework for a control is minimal, an evaluation can be expected to conclude that the costs of developing an administrative capability to implement a control should preclude the development of this capacity only for the relatively rare control techniques requiring substantial restructuring and expansion of the agency's staff.

Similarly, to facilitate the evaluation of the desirability of applying a control in a particular situation, the analyst should estimate the net total cost which will be incurred by society as a result of the control. The net total cost of a control can be calculated as:

- The estimated change in the market value of the property or properties to which the control is applied,* plus

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*The estimated change in the market value of the controlled property should incorporate the private cost of complying with the administrative review requirements which have been established to implement the control. However, if the methodology employed to estimate this change in market value does not appropriately account for this cost, an independent estimate of the private cost of compliance must be added to the estimated change in market value.

- The estimated cost to the public agency of applying the administrative process which has been established for the implementation of the control.

This net total cost can then be compared to the quantifiable benefits produced by the control (e.g., the estimated increase in the market value of properties, other than the controlled property, attributable to the technical and aesthetic improvements in environmental quality produced by the control) in formulating an assessment of the desirability of applying the control.

A suggested format for displaying the results of this analytical procedure, which should facilitate the comparison of the desirability of alternative control policies, is presented in Exhibit 3.1.

Recommended procedures for measuring each component of the net total cost of a control are described in the following two sections. Using these procedures, an agency should, in most situations, be able to provide both a reasonably precise estimate of the cost of applying the administrative process for a control, and an acceptable estimate of the change in market value of the property to which the control is applied. However, as noted above, providing an adequate estimate of the increase in the market value of other properties attributable to the improvements in environmental quality produced by the control frequently will be impossible. In most cases, it will be necessary to omit this component of net total cost from the agency's evaluation of the cost-effectiveness of alternative control policies. Moreover, obtaining reasonable estimates of the benefits of the control which are not reflected in increases in property values will, in general, be even more difficult. It will almost invariably be necessary to omit these components of net total cost from the cost-effectiveness analysis.

EXHIBIT 3.1: Format for Comparing Net Total Societal Cost of Alternative Pollution Control Policies

Cost or Benefit	Pollution Control Policy		
	A	B	C
Decrease in market value of controlled property			
Cost of resources utilized to fulfill requirements of control			
Incremental private cost of complying with administrative review process .. Administrative fees .. Analytical studies .. Public relations .. Consultant costs .. Litigation .. Delays in development			
Net Total Private Cost			
Incremental public cost of enforcing compliance with requirements of control .. Management of administrative review process .. Analytical studies .. Litigation .. Monitoring and enforcement .. Less: Administrative fees			
Net Cost to Public Agency			
Net Total Cost			
Quantifiable benefits (e.g., increases in market values of properties benefitted by improved environmental quality)			

3.4 Procedures for the Measurement of Public and Private Administrative Costs

The public sector incurs costs in establishing and applying administrative processes for the implementation of pollution controls. Similarly, the private sector incurs costs in complying with the requirements of the administrative processes. However, since each activity which generates public or private administrative costs involves either direct or indirect utilization of scarce resources, the costs attributable to these activities can be estimated in essentially the same manner -- regardless of whether the activity constitutes a transfer of income between the private and public sectors (e.g., the payment of administrative fees), a direct utilization of labor and materials (e.g., the preparation and submission of an analytical study, or the monitoring and enforcement of compliance with the stipulations of a control), or a suboptimal use of resources (e.g., a delay in the development of a property).

3.4.1 Calculating Administrative Costs for Each Year During the Planning Period

To estimate the total cost of any public or private administrative activity, it is first necessary to identify the cost attributable to the performance of the activity for each year during the planning period. To maintain consistency with the procedures established for the cost-effectiveness analysis of structural pollution controls,* the planning period for the cost-effectiveness analysis of nonstructural pollution controls should be twenty years.

Thus, to evaluate the total cost associated with the payment of administrative fees, one must determine the total volume of administrative fees expected to be paid by potential developers in each of the next twenty years. Similarly, to assess the total cost attributable to the monitoring and enforcement of compliance with the control, it is necessary to estimate both the quantity of each labor and material resource utilized in these activities during each year, and the market price paid to obtain a unit of each of these resources. The cost of monitoring and enforcing compliance with the control in each year can then be estimated as the sum of the products of the market prices and the utilized quantities of resources during the year. Finally, to calculate the total cost arising from a delay in the development of a property, it is necessary to estimate the net return (i.e., the difference between the revenue from development and the cost of development) which will be generated by the property each year both if the development proceeds without delay and if the development is delayed by administrative review procedures. The cost attributable to delay in each year can then be estimated as the difference between the net return generated by the property if the development proceeds without delay, and the net return expected if the development is delayed.

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*See Federal Register, Vol. 39, No. 29, February 11, 1974, pp. 5269-5270.

3.4.2 Prices to be Used in Calculating Administrative Costs

The cost of an administrative activity should be calculated on the basis of the market prices prevailing at the time when the cost-effectiveness analysis is performed, i.e., base period dollars. The possibility of inflation of wages and prices should not be considered in the analysis. This procedure implicitly assumes that all prices involved in the analysis will tend to change over time at approximately the same rate. The results of a cost-effectiveness analysis should not be affected by changes in the general price level. Yet, if there is justification for expecting substantial changes in the relative prices of certain resources during the planning period, these prices should be adjusted over time to reflect their expected future relative deviation from the general price level.

3.4.3 Discounting Future Administrative Costs

After estimating the cost attributable to the performance of an administrative activity in each year during the planning period, an analyst should estimate the total cost of performing the activity throughout the period as the discounted present value of the series of annual costs. Present receipts of a particular dollar amount are more valuable than future receipts of the same dollar amount, since present receipts can normally be invested at a positive rate of return to yield greater wealth in the future. Consequently, it is necessary to discount future receipts to make them comparable to present receipts.

Thus, the total cost associated with the payment of administrative fees can be estimated as the discounted present value of the fees expected to be paid in each year during the planning period. Similarly, the total cost of the monitoring and enforcement of compliance with the control can be estimated as the discounted present value of the resources expected to be used in these activities. Finally, the total cost arising from a delay in development of a property can be estimated as the discounted present value of the difference between the net return expected to be generated by the property if the development proceeds without delay, and the net return expected to be generated if the development is delayed.

To calculate the discounted present value of the annual costs of performing any administrative activity, it is necessary to evaluate the equation:

$$PV = \sum_{t=0}^{20} C_t/(1+r)^t$$

where: PV = the discounted present value of the annual costs of performing the activity,

C_t = the cost of performing the activity during year t (where $t = 0$ in the year when the cost-effectiveness analysis is conducted), and

r = the interest (discount) rate.

3.4.4 The Interest Rate for Discounting Future Costs

To be consistent with the procedures established for the cost-effectiveness analysis of structural pollution controls, and to permit the comparison of the cost-effectiveness of structural and nonstructural controls, the same interest rate should be utilized in the cost-effectiveness analysis of both types of controls. The EPA requires the use of the interest rate set in the Water Resources Council's "Proposed Principles and Standards for Planning Water and Related Land Resources" in the cost-effectiveness analysis of structural pollution control projects. Therefore, this interest rate should also be used in the cost-effectiveness analysis of nonstructural pollution controls. Currently, the interest rate accepted by the Water Resources Council is 6-1/8 percent.

3.5 Procedures for the Measurement of Changes in Property Values

The application of a nonstructural pollution control can be expected to affect the market value of both the property to which the control is applied, and the properties which benefit from the improvements in environmental quality produced by the control. These changes in property value are important components of the net total societal cost of the control. Consequently, the estimation of the magnitude of these changes in property values is an important part of the evaluation of the cost-effectiveness of the control. This section is devoted to the description and evaluation of alternative methodologies for estimating the magnitude of changes in property values.

3.5.1 Appraisal by a Single Assessor

The most direct approach to projecting the changes in property value attributable to a pollution control policy is to rely upon the opinion of an expert assessor. The primary advantage of this approach is its simplicity. It is easily understood, it is rapid, and it does not require an extensive data base. In addition, the courts are accustomed to relying upon the opinion of expert assessors in eminent domain condemnation proceedings.* Therefore, a planning agency should encounter little difficulty in convincing a court to accept the appraisal of a single assessor as evidence in a judicial action concerning either the legality of a particular nonstructural pollution control policy or the need for compensation if the policy is applied in a particular situation. Finally, in many cases, all available procedures for estimating changes in property values will incorporate such large inherent uncertainties that the application of a more complex or sophisticated technique would be unlikely to produce a better estimate.

To use the appraisals of a single assessor to estimate the change in the value of a parcel of land attributable to a particular control policy, it is necessary to:

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*See Lewis Orgel, Valuation Under the Law of Eminent Domain, 2nd Edition, 1953, 2 volumes, for specific examples of the judicial acceptance of an appraisal by a single assessor as a basis for the payment of compensation.

- Have the assessor develop an estimate of the current market value of the property (i.e., the value of the property under the present control structure);

- Have the assessor develop an estimate of the market value which the property would command if the proposed control policy were adopted;* and

- Calculate the difference between the preceding two estimates.

This difference is an estimate of the change in the market value of the property attributable to the control policy.

In incorporating an estimate of this type into a cost-effectiveness analysis of a control policy, it is necessary to know the factors considered by the assessor in formulating his estimate of the market value that the property would command if the policy were adopted. If the assessor has not taken account of the administrative costs of compliance which the developer of the property must bear, a separate estimate of these costs must be produced and included in the cost-effectiveness analysis. Conversely, if the assessor has appropriately accounted for the developer's compliance costs in his appraisal procedure, no separate estimate of these costs should be included in the cost-effectiveness analysis. Caution must be exercised to insure the inclusion of all relevant costs while avoiding double-counting.

An obvious disadvantage of relying upon a single assessor to appraise expected changes in property values is that his final estimate represents the opinion of only one individual. Although this individual may be highly regarded in his field, the danger of error or bias in a small sample of opinion is substantial.**

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*To facilitate the estimation of this value, the planning agency should qualitatively describe to the assessor the types of benefits and costs that might accrue to the property as a result of the control.

**See Otto A. Davis and Kenneth L. Wertz, "The Consistency of the Assessment of Property: Some Empirical Results and Managerial Implications," Applied Economics, Vol. 1, May, 1969, pp. 151-157; and Harold Brodsky, "Residential Land and Improvement Values in a Central City," Land Economics, Vol. 46, August, 1970, pp. 235-237, for empirical estimates of the extent to which assessments deviate from the market values of properties.

The possibility of error is especially great when the assessor attempts to assess the market value which a property will attain if a particular control policy is adopted, since he may have no historical comparisons to use in his appraisal. In addition, the proposed control policy may be a highly emotional and political issue in the community. Under these circumstances, the assessor undoubtedly will be playing a very sensitive and difficult role.

3.5.2 Group Estimation Procedures

A possible method of both reducing the likelihood of small sample error, and mitigating the influence of political pressure, is to develop a group estimate of the effect of a nonstructural pollution control on property value. The RAND Corporation has developed a widely applied procedure to produce group judgments on factual matters for which precise information either does not exist or cannot be obtained, or on values for which the required information is a matter of opinion. This estimating procedure -- the Delphi technique -- can be applied to structure and refine the subjective opinions of group members to promote group consensus. The Delphi technique has three basic characteristics: anonymity of individual responses, the statistical aggregation of responses, and feedback and iteration.

The anonymity of individual responses is preserved by having each group member complete a formal (usually unsigned) questionnaire and, then, guaranteeing that the contents of completed questionnaires are never revealed in a format which might permit the association of individual group members with their responses. This procedure allows each group member to formulate his opinion without peer group pressure, without fear of becoming personally involved in a controversy with special interest groups, and without undue influence from dominant individuals within the group.

The statistical aggregation of individual responses is accomplished by summarizing all of the responses to each item on the questionnaire in terms of a statistic such as the mean, median, or quartile values. This statistic is an indication of the group response to the item.

Finally, feedback and iteration are performed by providing the summary statistical information to each group member, and asking him to reconsider and, if necessary, adjust his responses to the questionnaire in view of the new information. The summarization and reestimation process is then repeated either for a predetermined number of iterations, or until no significant change in the group response is observed in successive iterations. The final product of the entire exercise is a statistically summarized final consensus of the group opinion.

The purpose of the feedback and iteration process is to permit the group members to benefit from each other's information. Those participants who are best informed and most confident of their responses should be less likely than their less knowledgeable colleagues to adapt their responses to the prevailing group response. Consequently, the consensus can be expected to converge upon the opinions of the most informed members of the group after several iterations.

Thus, it can be seen that the Delphi technique differs from a simple voting procedure because some individuals will have more influence upon the group consensus than others; while it differs from a group discussion because each participant has an equal opportunity to express his opinion. Since the Delphi process encourages all group members to learn, each participant should make increasingly informed judgments as the process moves toward the final group consensus.

To apply the Delphi technique to the estimation of the changes in property values attributable to a particular control policy, it is necessary to:

- Select a group of expert real estate assessors to participate in the Delphi exercise,

- Have each group member complete a questionnaire requesting an appraisal of the changes in property values which will occur if the control policy is adopted,

- Statistically summarize the group members' responses to each item on the questionnaire,

- Provide the summary statistical information to the group members, and ask them to reevaluate their responses to the questionnaire in view of the summary information, and

- Repeat the summarization and reevaluation process until the desired number of iterations or the desired degree of convergence has been accomplished.

The primary advantage of using the Delphi technique to estimate a change in property value is that the group consensus produced by the technique is a statistically better estimate than an appraisal by a single assessor. If the mean of the individual responses to the questionnaire is used to indicate the group consensus, the error of the mean will be less than the average error of the individual responses. Similarly, if the median of the individual responses is employed to represent the group consensus, the probability that the median will be as close or closer to the actual change in property value as any individual response will be 0.5.

In addition, estimates of changes in property values obtained through the Delphi technique should be readily acceptable to the courts as a basis for resolving compensation issues. The estimates of changes in property values produced using the Delphi technique are derived directly from the appraisals of several expert assessors. Moreover, the courts frequently consider the independent appraisals of numerous expert assessors, appearing as witnesses for either the state or private property owners, in determining condemnation awards in eminent domain proceedings.* Thus, it appears likely that the courts would also consider estimates of changes in property value obtained by applying the Delphi technique to be acceptable evidence in determining compensation payments, should this be necessary.

However, the time and labor requirements of the Delphi technique are much greater than the time and labor requirements of appraisal by a single assessor. The first iteration of the Delphi technique will require at least as much time and several times as much labor as an appraisal by a single assessor. Moreover, successive iterations of the technique will increase the total time and labor requirements accordingly. Nevertheless, by bearing these additional costs, an analyst can obtain a statistically more reliable estimate of the changes in property values attributable to any control policy.

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*See Lewis Orgel, Valuation Under the Law of Eminent Domain, Second Edition, 1953, 2 volumes.

For additional information concerning the application and the statistical properties of the Delphi technique, the following references should be consulted:

Brown, B., S. Cochran, and N. Dalkey, The Delphi Method II: Structure of Experiments, Santa Monica, California, The RAND Corporation, June, 1969.

Dalkey, Norman C., The Delphi Method: An Experimental Method in Group Opinion, Santa Monica, California, The RAND Corporation, June, 1968.

Dalkey, Norman C., Studies in the Quality of Life, Lexington, Massachusetts, D. C. Heath and Company, 1972.

Ludlow, John D., Sea Grant Delphi Exercises: Techniques for Utilizing Informed Judgment of a Multi-Disciplinary Team of Researchers, Ann Arbor, Michigan, Bureau of Business Research, University of Michigan, Working Paper 22, January, 1971.

Skutsch, Margaret, and Diana Hall, Delphi: Potential Uses in Educational Planning, Evanston, Illinois, Department of Industrial Engineering, Northwestern University, 1973.

3.5.3 Statistical Studies of Property Values

The preceding two methodologies for the estimation of the changes in property value attributable to a nonstructural pollution control rely upon the opinions of expert assessors as the basis for estimation. Although expert assessors can be expected to be knowledgeable about the nature of such changes in property value, assessors are not directly involved in the market transactions that determine property values. Consequently, their estimates of the magnitudes of changes in property value can be expected to deviate from the actual values of these changes.* Therefore, since the actual transaction price of a property is the most valid available measure of the willingness of members of society to pay for the property, statistical studies of actual transaction prices should provide improved estimates of the changes in property value resulting from nonstructural pollution controls.

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*See footnote ** on page 3.18, supra.

The basic premise underlying a statistical study of property values is that a property possesses a bundle of attributes, each of which contributes to some extent to the total market value of the property. Therefore, to conduct a statistical study of property values, it is necessary to collect and compile an extensive body of data describing both the transaction price and the attributes of a representative sample of properties. The specific attributes of properties which should be incorporated into a statistical property value study should include:*

- Characteristics of the property:
  - Total area of the property,
  - Topography of the property (slope, load bearing capacity, etc.),
  - Physical improvements on the property (age, size, physical condition, etc.),
  - Proportion of the property which is vacant, and
  - Availability of water supply and sewerage;
- Accessibility of the property:
  - Travel time to the central business district of the community,
  - Travel time to highways and major thoroughfares,
  - Travel time to shopping areas, and
  - Distance to water courses;
- Characteristics of the neighborhood:
  - School quality,
  - Crime rate,
  - Quality of police and fire protection,
  - Adjacency to a major traffic artery, a major commerical development, or a major industrial development, and
  - Condition of physical improvements on neighboring properties;

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*Consult the references cited on pp. 3.25 - 3.26 for descriptions of methods of measuring the values of attributes and for indications of the statistical significance and importance of the various attributes in determining property values.

- Water quality:
  - Biological oxygen demand (BOD), and
  - Suspended solids;

- Taxation of the property:
  - Property tax rate applied to the property,
  - Water and sewerage charges, and
  - Business license fees; and

- Regulation of the property:
  - Zoning of the property, and
  - Imposition of nonstructural pollution controls.

Since each user of land is free to choose to occupy that property which maximizes his personal welfare, properties which differ in price must also differ with respect to the bundle of attributes that they possess. Thus, the market value of any particular property will depend not only upon the attributes possessed by the property, but also upon the attributes of all other properties whose users could have chosen to bid for the property. That is, the market value established for any particular property will depend upon the differences between the attributes of the property and the attributes of other properties. Therefore, any statistical study conducted to estimate the effect of a nonstructural pollution control on property values must base its analysis upon a sample of properties which includes both properties to which the control has been applied, and properties which have not been, and are unlikely to be, subjected to the control. In general, the collection, compilation, and statistical analysis of a body of data describing such an extensive sample of properties will require the application of several person-years of labor and substantial amounts of computer time.

Also, the requirement that the sample of properties used in the analysis must include properties to which the control has already been applied necessarily implies that a statistical study can only be performed in situations in which a reasonable amount of experience with the implementation of the control has already been accumulated. Recognizing this requirement, a planning agency might reasonably wish to use in its planning district empirical estimates of the changes in property value resulting from the application of a control in another planning district. This transfer of results will only be justifiable if the patterns of development and the patterns of demand for various land uses are similar in the two districts. Therefore, a planning agency which desires to employ the empirical estimates provided by statistical studies of property values to evaluate the effects of nonstructural pollution controls on property values generally will have to conduct its own statistical study on property values -- and to incur the costs of conducting the study -- within its own planning district. Recognizing the extensive data and labor requirements of statistical property value studies, it appears unlikely that conducting such studies will be feasible for many planning agencies at the present time.

Descriptions of completed statistical studies of property values, and of the methodologies employed in conducting these studies, are available in:

Anderson, Robert J., and Thomas D. Crocker, "Air Pollution and Residential Property Values," Urban Studies, Vol. 8, October, 1971, pp. 171-180.

Bailey, Martin J., "Effects of Race and Other Demographic Factors on the Values of Single Family Homes," Land Economics, Vol. 42, May, 1966, pp. 215-220.

Brigham, Eugene F., "The Determinants of Residential Land Values," Land Economics, Vol. 41, November, 1965, pp. 325-330.

Brodsky, Harold, "Residential Land and Improvement Values in a Central City," Land Economics, Vol. 46, August, 1970, pp. 229-246.

David, Elizabeth L., "Lakeshore Property Values: A Guide to Public Investment in Recreation," Water Resources Research, Vol. 4, August, 1968, pp. 697-707.

Knetsch, Jack L., "The Influence of Reservoir Projects on Land Values," Journal of Farm Economics, Vol. 46, February, 1964, pp. 520-538.

Ridker, Ronald G., and John A. Henning, "The Determinants of Residential Property Values with Special Reference to Air Pollution," Review of Economics and Statistics, Vol. 49, May, 1967, pp. 246-257.

Rueter, Frederick H., "Externalities in Urban Property Markets: An Empirical Test of the Zoning Ordinance of Pittsburgh," Journal of Law and Economics, Vol. 16, October, 1973, pp. 313-349.

Sagalyn, Lynne, and George Sternlieb, Zoning and Housing Costs: The Impact of Land-Use Controls on Housing Prices, New Brunswick, New Jersey, Center for Urban Policy Research, Rutgers University, 1972.

Weiss, Shirley F., Thomas G. Donnelly, and Edward J. Kaiser, "Land Value and Land Development Influence Factors: An Analytical Approach for Examining Policy Alternatives," Land Economics, Vol. 42, May, 1966, pp. 230-233.

Wieand, Kenneth F., "Air Pollution and Property Values: A Study of the St. Louis Area," Journal of Regional Science, Vol. 13, April, 1973, pp. 91-95.

In addition, for discussions of the theoretical basis of statistical property value studies and their applicability to the evaluation of public policy, the following references should be consulted:

Anderson, Robert J., and Thomas D. Crocker, "Air Pollution and Property Values: A Reply," Review of Economics and Statistics, Vol. 54, November, 1972, pp. 470-473.

Bahl, Roy W., Stephen P. Coelen, and Jeremy J. Warford, "Land Value Increments as a Measure of the Net Benefits of Urban Water Supply Projects in Developing Countries," in C. Lowell Harriss, ed., Government Spending and Land Values, Madison, Wisconsin, University of Wisconsin Press, 1973, pp. 171-188.

Freeman, A. Myrick III, "Air Pollution and Property Values: A Methodological Comment," Review of Economics and Statistics, Vol. 53, November, 1971, pp. 415-416.

Freeman, A. Myrick III, "On Estimating Air Pollution Control Benefits from Land Value Studies," Journal of Environmental Economics and Management, Vol. 1, May, 1974, pp. 74-83.

Freeman, A. Myrick III, "Spatial Equilibrium, the Theory of Rents, and the Measurement of Benefits from Public Programs: A Comment," Quarterly Journal of Economics, Vol. 89, August, 1975, pp. 470-473.

Lind, Robert C., "Spatial Equilibrium, the Theory of Rents, and the Measurement of Benefits from Public Programs," Quarterly Journal of Economics, Vol. 87, May, 1973, pp. 188-207.

Lind, Robert C., "Spatial Equilibrium, the Theory of Rents, and the Measurement of Benefits from Public Programs: Reply," Quarterly Journal of Economics, Vol. 89, August, 1975, pp. 474-476.

Polinsky, A. Michael, and Steven Shavell, "The Air Pollution and Property Value Debate," Review of Economics and Statistics, Vol. 57, February, 1975, pp. 100-104.

Small, Kenneth A., "Air Pollution and Property Values: Further Comment," Review of Economics and Statistics, Vol. 57, February, 1975, pp. 105-107.

4.0 ASSESSING THE SOCIAL IMPACTS OF NONSTRUCTURAL POLLUTION CONTROLS

The analytical procedures recommended in this chapter have been developed to support the "economic, social, and environmental impact" assessment required by Section 208 (b)(2)(E) of the Federal Water Pollution Control Act Amendments of 1972.

The application of the evaluation methodology described in the preceding chapter will identify the particular control which can be expected to achieve any specified water quality objective at minimum total cost to society. However, merely demonstrating that the implementation of a particular control will permit the attainment of specified water quality objectives at minimum total cost does not necessarily indicate that the control is desirable.

Almost invariably, the implementation of a control will cause some individuals or groups to incur costs in excess of the benefits they obtain, while it permits other individuals or groups to obtain benefits in excess of the costs they incur. Some people may suffer losses in employment, income, or wealth because of the policy; while other individuals may experience improvements in their economic opportunities as a result of the control. Similarly, the increases in personal satisfaction obtained from the improvements in environmental quality produced by the control will not be distributed equally throughout society.

If the implementation of the control which fulfills the specified water quality objectives at minimum total cost also produces unacceptably adverse social impacts, it will be preferable to implement another control which entails greater total cost, but produces a less adverse effect upon the distribution of welfare among the various members of society. Consequently, in evaluating the desirability of implementing any control, it is necessary to consider both the overall cost-effectiveness and the distributional social impacts of the control. The remainder of this chapter describes procedures for the assessment of the distributional social impacts of a pollution control.*

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*See also Abt Associates, The Social Impacts of Having Clean Water, prepared for National Commission on Water Quality, 1975 (available from NTIS), for case studies and analytical techniques.

4.1 Employment and Income Effects

The imposition of a binding control upon the use of any parcel of land will, as stated earlier, affect the nature of the activity performed on the property. In fact, at the extreme, the imposition of a binding control on a parcel of land may completely preclude the activity which would take place without the control.

Obviously, effects of this type may have significant consequences for both the level of employment within the region in which the control is imposed, and the income earned by the residents of the region. If the activity displaced from the controlled property does not merely shift its location to another site within the region, and if the controlled property does not attract a permissible activity whose employment requirements are equivalent to those of the displaced activity, these consequences may be extremely adverse. Conversely, if the displaced activity merely shifts its location to another property within the region, or if the controlled property successfully attracts an acceptable activity whose employment requirements are similar to the displaced activity, the significance of these consequences may be minimal.

Unfortunately, it is impossible to give general assurance that the latter types of effects will prevail after the application of a control. Rather, the extent to which the levels of employment and the income of the region are affected by the control is determined largely by the suitability of available sites within the region as locations for economic activities relative to available sites in other regions. Specifically, a region will retain a displaced activity if an alternative site is available in the region, which is both sufficiently suitable for the displaced activity, and more suitable than the best available site in any other region. The region will attract an acceptable activity to the controlled property if the property is not only sufficiently suitable for the activity, but more suitable than other available properties in other regions.

To evaluate the suitability of any particular site for economic activities, it is necessary to determine that both the characteristics of the region where the site is located, and the attributes of the site itself, are appropriate for the activity. To assess the appropriateness of a region for any particular activity, it is necessary to consider the following questions:

- Is the supply of labor within the region satisfactory for the performance of the activity? Is labor with appropriate skills (i.e., unskilled, semi-skilled, skilled, professional, etc.) sufficiently available at acceptable cost? Does the region have a history of labor unrest and work stoppages? Is the productivity of the labor force considered to be high? Can additional labor with appropriate skills be readily attracted to the region?

- Are the transportation facilities of the region adequate? Are highways, railroads, airports, water transportation, and pipelines available in acceptable quantities at reasonable cost? Are the frequency and reliability of service by these various transportation media satisfactory for the performance of the proposed activity?

- Is the region accessible to sources of the raw materials and manufactured inputs required for the performance of the activity?

- Is the region accessible to markets for the output of the activity?

- Do the public policies of the region encourage the performance of the activity? Do the existing laws and regulations (especially laws and regulations concerning environmental pollution, land use, and unionization) support the initiation of the proposed activity? Are the taxation and subsidy policies of the region favorable to industry and commerce? Are these policies administered in a non-arbitrary and non-discriminatory manner? Are regional public administrators cooperative with business interests?

- Are the educational, cultural, recreational, and medical facilities in the region adequate in quantity and quality? Is the climate of the region suitable for the performance of the proposed activity?

Similarly, to appraise the appropriateness of a particular site for the performance of any activity, the following questions must be answered:

- Is the size and configuration of the site appropriate for the performance of the activity? Are the physical improvements on the site suitable for the performance of the activity? Is the cost of the property acceptable?

- Is the site geologically suitable for the performance of the activity? Is the site susceptible to periodic flooding? Are problems of drainage or seepage likely to arise? Is the load-bearing capacity of the soil sufficient to support the proposed development, or must costly adjustments be made? Will extensive grading be required to permit the initiation of the proposed activity? Is the cost of constructing, operating, and maintaining physical improvements on the site acceptable?

- Is the site accessible to transportation? Are rail, water, air, pipeline, and highway transportation services available in sufficient quantities at acceptable costs? Are the quality, frequency, and reliability of these transportation services satisfactory for the performance of the desired activity?

- Are public facilities available to the site in adequate quantities at reasonable cost? Are water supply and sewerage services satisfactory? Are electrical power and natural gas available in sufficient amounts and continuous supply? Are telephone service and mail delivery acceptable? Are fire and police protection adequate? Is the cost of insurance at the site acceptable?

- Do the laws and regulations of the community in which the site is located permit the performance of the proposed activity on the site? Especially, is the zoning of the site appropriate for the performance of the activity?

Is the outward appearance of the site attractive? Is the site situated in appealing and harmonious surroundings? Are adjacent land uses compatible with the activity whose initiation is proposed on the site? Is the site accessible to shopping and residential areas? Is the reputation of the neighborhood conducive to attracting good employees?

Thus, to demonstrate that a particular site is the most suitable location for a certain economic activity, all of these questions must be considered relative to all alternative potential sites for the activity.

Yet, it might well be impossible for a planning agency to conduct such a complex analysis each time it desires to assess the social desirability of adopting a control that might displace the economic activity on a parcel of land. Nevertheless, the preceding locational considerations can be employed in a less comprehensive manner by planning agencies to obtain insight into the effects that controls may exert on employment and income in their regions.

In particular, to assess the likelihood that a displaced activity will merely shift its location to another site in the region considering a control, it is recommended that the planning agency for this region should, first, use the site-specific location considerations to determine if there are other economically feasible sites for the activity in the region. Then, if any suitable sites are identified, the agency should use the region-specific considerations to determine whether any other region is more suitable for the activity.

Similarly, to assess the likelihood that the controlled property will attract a permissible activity whose employment requirements are equivalent to those of the displaced activity, the planning agency for the region should, first, use the site-specific considerations to determine whether any permissible activity with these employment requirements is economically feasible. Then, if any suitable activities are identified, use the region-specific considerations to determine whether the region is sufficiently appropriate to attract the activity.

On the basis of these assessments, if it is determined that there is a substantial possibility that if a particular control is applied to a property, the region will suffer a decrease in employment as a result, it is necessary for the planning agency for this region to balance the cost-effectiveness of the control against the risk that adopting the control will produce adverse employment and income effects.

If it is determined that a control is unlikely to cause any decreases in overall employment or income in the region, it may still be undesirable to implement the control if it can be expected to decrease employment and income for some population groups in the region, while increasing employment and income for other groups. In situations of this type, it is desirable for the planning agency to balance the cost-effectiveness of implementing this control with the effects that the control can be expected to exert on the distribution of employment and income among the various population groups.

4.2 Tax Base Effects

Even when it is determined that the implementation of a control which might displace an activity is unlikely to exert any adverse effects on employment and income in the region, it may still be undesirable to adopt the control because of the effects which its implementation might have on the tax bases of the various political jurisdications in the region. Specifically, if a particular control can be expected to displace an activity to another site in a different political jurisdiction in the region, this control can also be expected to decrease the property tax base of the political jurisdiction from which the displaced activity has moved and to increase the property tax base of the political jurisdiction where the activity relocates. Whenever it is determined that this situation is likely to arise, it will be necessary for the planning agency to balance the cost-effectiveness of implementing the control against the impact that the control is likely to exert on the property tax bases of the jurisdictions in its region.

4.3 Effects Upon Individual Property Values

The application of a nonstructural pollution control to any parcel of land almost invariably causes a decline in the market value of this parcel of land. Yet, the aesthetic and technical improvements in environmental quality that result from the control can be expected to produce increases in the market values of other properties that benefit directly from these improvements. Moreover, the properties which represent alternative locations for the activities restricted by the control can be expected to experience increases in their market values as a result of the adoption of the control. Thus, a control on any particular property can, generally, be expected to cause substantial modifications in the distribution of wealth among owners of property both within the region applying the control and in other regions. Unless compensatory techniques have been established which reconcile these modifications in the distribution of wealth, it will be necessary for the planning agency to balance the cost-effectiveness of implementing this control with the effects that it can be expected to have on the distribution of wealth among property owners in the society.

Unfortunately, traditional economic principles do not provide much guidance concerning the most socially desirable method of balancing cost-effectiveness and equity considerations. The evaluation of the desirability of adopting a control which might cause a decrease in the personal welfare of an individual requires value judgments that balance the relative importance of cost-effectiveness and equity considerations. Since traditional economic analysis is not applicable to this kind of value judgment, this determination is the appropriate responsibility of the political process. Thus, the evaluation of the tradeoffs between cost-effectiveness and equity which are inevitably confronted in the implementation of nonstructural pollution controls must remain the responsibility of the local planning agency authorized to develop proposals for implementing such controls.

Nevertheless, to facilitate this tradeoff evaluation, it is desirable to provide detailed information describing the impacts which the implementation of any particular control can be expected to have on the distribution of employment, income, wealth, and tax bases within the local planning agency and throughout society. A possible format for displaying this information in evaluating the relative desirability of alternative control policies is presented in Exhibit 4.1.

EXHIBIT 4.1: Format for Evaluating the Social Impact of Alternative Pollution Control Policies

Social Impact*	Pollution Control Policy		
	A	B	C
Employment and income displaced from the controlled property			
Less: Employment and income relocated from the controlled property to alternative sites within the planning district			
Less: Employment and income locating on the controlled property			
Net effect on total employment and income within the planning district			
Effect on employment and income of various population groups within the planning district			
Effect on tax bases of the various local political jurisdictions within the planning district			
Effect on the values of individual properties, and the wealth of individual property owners, within the planning district			

*In many cases, social impacts can only be described in comparative terms, contrasting the effects of alternative policies.

5.0 EQUITY ASPECTS OF NONSTRUCTURAL POLLUTION CONTROL AND THE FEASIBILITY OF ALTERNATIVE COMPENSATORY MECHANISMS

The application of any of the nonstructural pollution controls which are presently available frequently will cause at least the owners of the properties to which the control is applied to absorb costs which exceed the value of their benefits from its application -- regardless of the extent to which the imposition of the control produces societal benefits in excess of societal costs. The magnitude of the decreases in property value which are suffered by these individuals may be sufficiently large to be considered by the courts to constitute an unconstitutional "taking" of private property, unless some reasonable amount of compensation is provided to the adversely-affected property owners.

In recognition of this potential legal and economic problem, a number of control techniques have been developed which employ the police power, or a combination of the police power and eminent domain, to restrict the private use of land while, at the same time, compensating the landowner in some manner for the loss in value resulting from the restrictions. In evaluating these techniques, the legal power to take particular action, the reasonableness of the action, and the nature of the action as regulation, eminent domain, or public works (discussed in Chapter 2.0 of this manual) will control the governmental entity's ability to employ the particular technique.

Using regulatory powers only, a governmental agency with appropriate authority may provide some measure of compensation to a landowner whose property is subjected to additional restrictions by relaxing some existing controls upon the development of his property at the same time that these additional restrictions are imposed. In the same manner that the imposition of the additional restrictions can be expected to reduce the market value of his property, the relaxation of existing controls can be expected to generate an offsetting increase in its market value and, hence, compensate the landowner to some extent for the loss in value which results from the imposition of the new restrictions.

Thus, through planned unit development (PUD) controls on parcels of land, a governmental agency with appropriate authority may allow more intense development of a parcel where particular requirements are met than would be permitted otherwise.* Existing zoning and subdivision controls may restrict the permissible development of a particular area to low-density residential uses on individual zoning lots. Development in accordance with the regulations would result in substantial open space and limited coverage of each lot with impervious surfaces -- roofs, driveways, walks, and roadways -- due to large lot and yard requirements. The impact of a low-density development of this type on certain public facilities -- e.g., sewage treatment or water treatment plants -- would also be limited. Other public facilities costs -- roads, sewer and water line, other utility costs, and public safety costs for police and fire -- might be greater because of the sprawling nature of development, the likelihood that it would occur in a sporadic, uncoordinated manner, and the possible need to locate privately-owned facilities to service the residents or employees of the area elsewhere within the community, or in other communities.**

Under PUD controls, the governmental entity can permit a developer who has acquired a sufficiently large parcel of land to develop that parcel essentially as a single large lot (or a few large lots) in a manner which will concentrate the intensity of the use on one or more locations within the parcel while, under appropriate controls, the balance of the parcel remains in open space. This technique can offer advantages both to the regulating entity and to the developer. For example, residential development of a 100-acre tract under traditional one-acre minimum lot and single-family detached house controls might result in no more than 80 dwelling units in the tract, the remaining 20 acres being required for public facilities -- primarily streets and other rights-of-way. The same 100-acre tract, under PUD controls, might be developed for 100 dwelling units in multi-family dwelling units or a combination of multi- and single-family dwelling units, and including necessary parking, streets, and other facilities on 20 acres with the remaining 80 acres being devoted to open space or other low-density uses under appropriate controls to assure that it will not be subjected to intensive development at a later time. Non-residential activities -- retail shops, office space, and light industrial uses -- to serve the residents of the development may also be permitted within the PUD area. The developer is able to save on construction costs by making more intensive development of a smaller land area and thus realizing economies of scale. At the same time, the governmental entity realizes similar economies in the provision of public services -- shorter utility service lines, less area for police and fire services, less public rights-of-way to be maintained.

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*The leading exposition of legal aspects of planned unit development controls is "Symposium: Planned Unit Developments," 114 U. Pa. L. Rev. 8 (1965); see also Hagman, §227-241; R. W. Bushell, ed., Frontiers of Planned Unit Development: A Synthesis of Expert Opinion, Center for Urban Policy Research, Rutgers University, 1973.

**For a discussion of the fiscal impact of alternative development patterns, see Real Estate Research Corporation, The Costs of Sprawl, prepared for CEQ, EPA, HUD, Washington, D.C., U. S. Government Printing Office, April, 1974, GPO Stock Number 4111-00021.

Closely related to this technique, although somewhat less complicated, are the use of "cluster zoning" and "intensity bonus" zoning.* "Cluster zoning" affords many of the same economic benefits to developer and governmental entity as PUD controls -- more intensive development of a smaller portion of the developer's land area, with the balance of the area being maintained as open space or low-density uses. It does not permit the mixture of uses -- residential, commercial, and industrial -- which PUD controls may allow, however. In "intensity bonus" controls, a developer will be permitted to make a more intensive use of land than the traditional regulations would allow, if sufficient additional facilities are provided in connection with the development to reduce or eliminate the adverse impact of that more intense use upon surrounding land. The more additional facilities the developer is willing to provide, the more intensive use of the land will be allowed. Particularly with regard to "intensity bonus" zoning, the central legal issues will be the power of the governmental entity to grant "bonuses" in exchange for more adequate development planning or the provision of capital (infrastructure) and other public facilities at private expense, and the reasonableness of the governmental demands as measured by the available "bonuses."

As long as the demands are reasonably related to the impact of the proposed development upon the community, no charges of improper "takings" should be successful. However, any regulations of this sort should enable a prospective developer to know in advance and with some degree of certainty just what tradeoffs are available. This requires that the regulations provide adequate standards to govern the granting of "bonuses" or other concessions by the governmental entity. Otherwise, the regulation and the resulting development is susceptible to attack as "contract zoning," an impermissible technique in many states.* As a general proposition, a governmental entity is not allowed to sell, or bargain away, its regulatory powers, nor to exercise those powers on a *quid pro quo* basis. Thus, the presence of adequately defined standards, with equal treatment available to all who meet the minimum qualifications of the regulation, provide an important safeguard against this type of attack.

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*Hagman §236 contains a good discussion of the conceptual differences among PUD's, cluster zoning, and density zoning.

Yet, no one should assume that PUD will solve all of the problems related to control of land use development. It does offer the regulatory agency and the developer greater flexibility to deal with existing and potential problems of many types. However, there are some additional costs associated with the use of this control and its relatives which may not be present in traditional development techniques.** There are some indications significant increases in density may be required to make the PUD or cluster zoning attractive to developers. These types of developments often involve increased professional fees -- architectural, legal, and accounting -- and costs, as well as substantially greater lead time due to the common requirement that PUD developments be the subject of one or more public hearings. Often, a public hearing may be required, first, before the planning agency and, later, before the municipal legislative body, before a final permit is issued. There can also be increased landscaping and other amenity costs which the developer must bear until all or a substantial part of the dwelling units have been sold or some other entity assumes responsibility for them.

PUD, "cluster zoning," and "intensity bonuses" offer the planners some valuable aid in the development of strategies for nonstructural water pollution controls. The disturbance of ground cover during construction phases can be minimized. The amount of impervious ground

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*See Hagman §94. For some illustrative cases, see Suski v. Mayor and Comm'rs of Borough of Beach Haven, 333 A.2d 25 (N. J. intermediate court 1975); *compare* Transamerica Title Ins. Co. v. City of Tucson, 533 P.2d 693 (Ariz. 1975) *with* Gerla v. City of Tacoma, 533 P.2d 416 (Wash. 1975).

**See Mandelker, *Controlling Planned Residential Developments* (A.S.P.O. 1966); *Legal Aspects of Planned Residential Developments* (Urban Land Institute, Technical Bulletin No. 52, 1965); Brazell, "Comparative Costs for Open Space Communities: Rando Bernado Case Study," *Land Use Controls Annual*, 35-40, 1967.

coverage can be limited and made more manageable. Open space, which is maintained as open space for a considerable period of time, provides runoff controls, recharge areas, natural filtering, and other readily apparent advantages.

Another technique which has been used in the United States, but with limited success, is that of "compensatory zoning."* Where land is zoned so as to restrict the owner's use of it, the owner will be compensated from the public treasury for the decrease in value resulting from the imposition of the zoning regulation.

Most of the American efforts at "compensatory zoning" occurred at a time when the legal theorites supporting regulatory control of land use, the zoning power, were in their infancy. These efforts are too old and too few to provide sufficient information to assess either the equity or the effectiveness of the technique. One of the early zoning theorists commented as follows on the relative merits of regulatory and "compensatory zoning":

> Regulation under the police power adapts itself easily to the growth and change of the municipality. If the regulation is so arbitrary that it amounts to a taking of property, the courts will pronounce it void. Efforts to frame enabling acts so that in such cases damages shall be awarded, have caused confusion.**

No evidence has been discovered of any governmental entity in the United States which has tried to invoke the other side of this coin, however, by requiring an owner whose land has increased in value as a result of a zoning or other land use control activity to pay that increase to the government through the imposition of betterment taxes or capital gains taxes on land.***

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*Hagman 828. City of Kansas City v. Kinelle, 446 S.W. 2d 807 (Mo. 1969); State _ex. rel._ Twin City Bldg. and Inv. Co. v. Houghton, 176 N.W. 159 (Minn. 1920). For an early criticism of this technique, see Bassett, _Zoning_ 27 (1936).

**Bassett, _Zoning_ (1940) 27.

***A qualification of this statement is required. In some states, a property owner may agree with the local taxing authority to devote the land to certain low-density uses -- agriculture, silviculture or open space -- in return for a reduced assessed valuation of the land at its value for that use rather than what otherwise would be its fair market

The British government attempted, in the Town and County Planning Act of 1947, to utilize a similar technique by, in effect, freezing land uses and land values as of July 1, 1948, and establishing a fund of 300 million pounds with which to compensate landowners subsequently denied development permission for changes in existing land use, and assessing a development charge equal to the full increase in value of the land which would result from the granting of development permission. The development charge was abolished in 1953 and the compensation provisions in 1959, apparently as administratively unworkable.*

Another technique which is receiving considerable theoretical discussion is the use of "development rights transfer."** Here the argument goes as follows: Certain land otherwise suitable for more intensive development, called a "preservation district," should not be permitted to be developed as intensively as modern technology might otherwise make possible because of some unique and important

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value for development purposes. These states usually impose a capital gains tax or "recoupment tax" on the land value should it cease to be held for the agreed to use. Such legislation is normally permitted only by special amendment to the state constitution. See Gregory C. Gustafson and L. T. Wallace, "Differential Assessment as Land Use Policy: The California Case," 40 J.A.I.P. 379 (1975); William R. Bryant and Howard E. Conklin, "New Farmland Preservation Programs in New York," 40 J.A.I.P. 390 (1975); Henke, "Ad Valorem Taxation of Agricultural Land in Tennessee," 4 Memphis State 117 (1973); "Property Taxation of Agricultural and Open Space Land," 8 Harv. J. of Logic. 158 (1970); Hagman, "Open Space Planning and Property Taxation - Some Suggestions," 1964 Wis. L. Rev. 628.

*For a brief, but enlightening discussion of this effort, see W. O. Hart, "Control of the Use of Land in English Law," in C. Harr, ed., Law and Land (Harvard University Press and the MIT Press, 1964) 3, 12-13; and D. Heap, "English Development Plans for the Control of Land Use," ibid., 79, 82-86. For a description of the present English system, which allows the government to purchase land in certain situations after development permission has been denied, see Bosselman, et al., The Taking Issue (1973), Chapter 14.

**See materials cited in n. 39 of Chapter 2.0 supra; and see J. G. Rose, ed., Transfer of Development Rights (Center for Urban Policy Research, Rutgers University, 1975) for a useful collection of edited materials; "Comment, The Unconstitutionality of Transferable Development Rights," 84 Yale L. J. 1101 (1975).

characteristics of the land -- its landmark or historic significance, its importance to ecological balance of the region, its fragile environment, or its peculiar aesthetic features. Rather than removing the land from private ownership, the land is assigned a development potential without regard to its unique characteristics. Next, a determination is made of the extent to which owners of land within this "preservation district" may develop their land without adversely affecting those unique features which the regulations are designed to protect. The owners may proceed to develop their land to that extent, "using" an appropriate number of the total "development rights" assigned to their parcels if they so desire.

Other areas of the community, called "transfer districts," where more intensive development may be appropriate in light of the limited development now allowed in the "preservation district," are identified and assigned two levels of development potential. The first, or lower, intensity development potential, defined in terms of "development rights" assigned to parcels in the "transfer district," indicates development which can occur there as of right. The second, or higher, level of development potential, indicates the additional amount of development allowed if the owner obtains a given amount of the "development rights" assigned to land in the "preservation district."

The owner of the land in the "preservation district," whose development potential is limited by these controls because of the necessity of protecting the general area from adverse effects of intense development, may sell in the private market the right to make more intensive development of that land to someone whose land is located in a "transfer district" where the more intensive development will not have the same adverse impact. The success of this mechanism depends heavily on a number of factors, including: (1) the development of a private market for the intangible "development rights," including acceptance of the concept by landowners, developers, and financial institutions; (2) the establishment of a workable definition of development rights; and (3) a system of accounting for the assignment and transfer of "development rights."*

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*One municipality which is attempting to use the "development rights" approach to environmentally based zoning is Collier County, Florida, whose Board of County Commissioners, on October 8, 1974, adopted a Comprehensive Zoning Ordinance to implement the County's Growth Plan and Comprehensive Plan. Section 9 of that ordinance provides for the transfer of development rights as an incentive for retaining environmentally sensitive land areas in their natural state.

Clearly, because the legal precedents which determine the judicial acceptability of each of these mechanisms are established in the courts of the individual states, the legal feasibility of implementing each mechanism is likely to differ among states. Consequently, the establishment of general conclusions concerning the legal feasibility of employing each mechanism in all states is impossible. Moreover, the political acceptability and administrative feasibility of implementing any of these compensatory mechanisms is also likely to differ among states and, more importantly, among local political jurisdictions. Therefore, before any local planning agency attempts to use any of these compensatory mechanisms, it invariably will be necessary for this agency to investigate the legal feasibility, political acceptability, and administrative feasibility of implementing this mechanism within its political jurisdiction. A possible format for summarizing the results of this investigation is presented in Exhibit 5. 1.

.4: Format for Evaluating Alternative Compensatory Mechanisms

Compensatory Mechanism	Legal Feasibility of Mechanism	Administrative Feasibility of Mechanism	Political Acceptability of Mechanism
Regulatory controls:			
Planned unit development			
Cluster development			
Intensity bonus zoning			
Taxation and subsidy controls:			
Compensatory zoning			
Preferential property tax assessment			
Betterment tax			
Capital gains tax on land			
Development rights transfer			